LB 1587
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(1912)

Manual Training
FOR THE
Rural Schools

LOUIS M. ROEHL

Manual Training for the Rural Schools

A Group of Farm and Farm Home Woodworking Problems

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The Bruce Publishing Company
MILWAUKEE, WIS.

LB1598
R6
1922

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The Bruce Publishing Company
Printed in the United States
of America

OCT 13 '22

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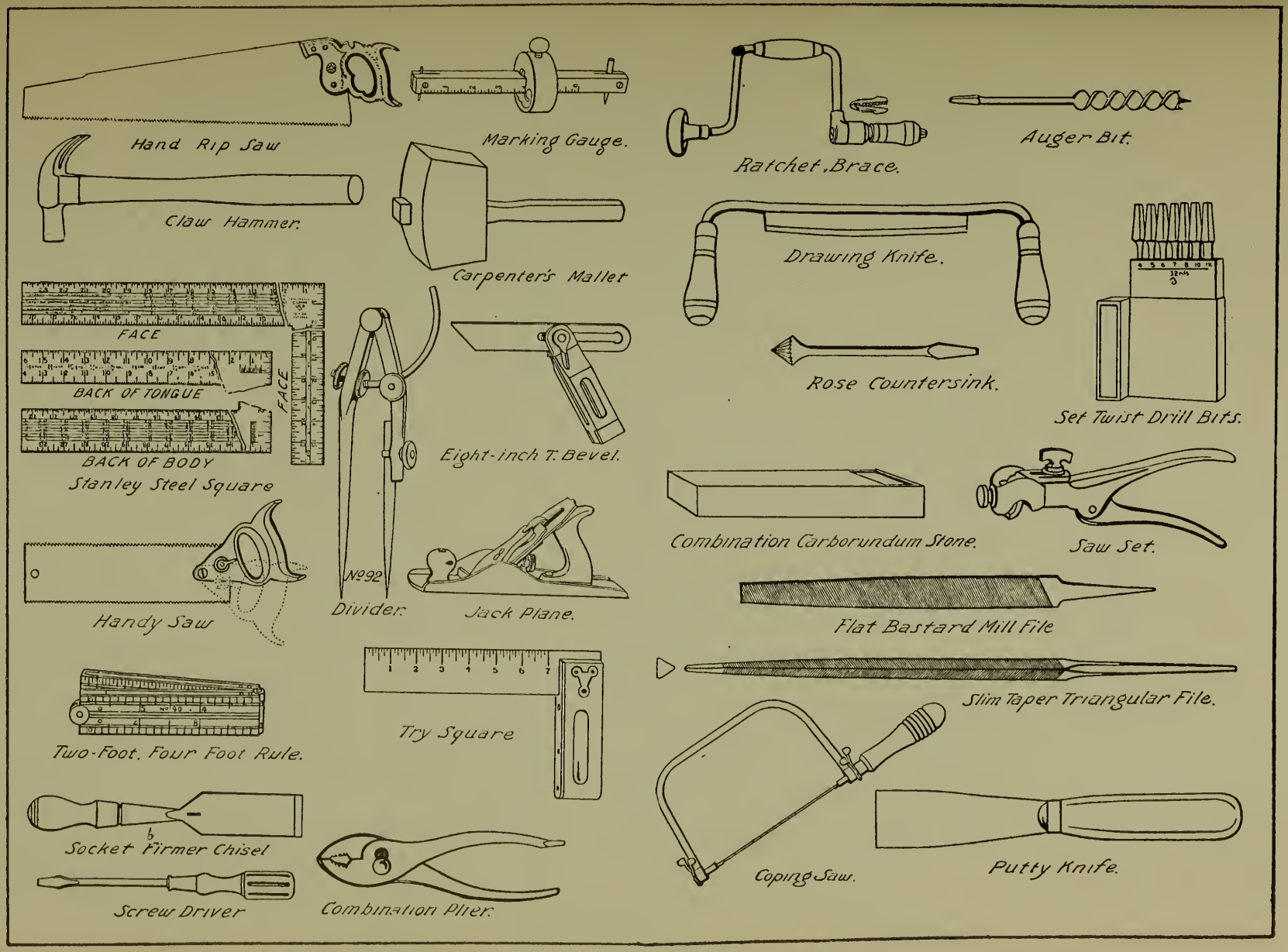
WOODWORKING EQUIPMENT FOR COUNTRY SCHOOLS

1—22-inch Hand Rip Saw 8 Point.
1—22-inch Hand Cross Cut Saw 8 Point.
1—Claw Hammer, 12 oz. Straight Claw, Plain Face.
1—Jack Plane, 14-inch with 2-inch Cutter.
1—Try Square, 8 inch.
1—T bevel, 8 inch.
1—Marking Gauge, No. 0.
1—Divider, 8 inch.
1—Carpenter's Mallet, 2¾ x 3¾ inches.
1—2-foot Four Fold Rule, Brass Bound.
1—¼-inch Socket Firmer Chisel.
1—½-inch Socket Firmer Chisel.
1—¾-inch Socket Firmer Chisel.
2—Bench Stops.
1—8-inch Bench Brush.
1—Steel Rafter Framing Square.
1—Bench Hook.
1—6-inch Screw Driver.
1—4-inch Screw Driver.
1—Ratchet Brace, 8-inch Sweep.
1—10-inch Flat Bastard Mill File, with Handle.
1—6-inch Slim Taper Triangular File, with Handle.
1—8-inch Drawing Knife.
1—Nail Set, 3-32 inch.
1—Rose Countersink.
1—Saw Set.
1—6-inch Slip-Joint Combination Plier.
1—Putty Knife.
1—Set of Auger Bits, ¼ to 1 inch.
1—Coping Saw, Nickel Plated, Wire Frame with Three Dozen Blades, Bit Stock Drills with Square Shank, for Wood or Metal, 3 each, 3-32, ⅛, 5-32, 3-16 inch.
1—2 x 8 inch Carborundum Combination Sharpening Stone.
1—10-inch Hack Saw.


Hand Rip Saw
Marking Gauge.
Claw Hammer.
Carpenter's Mallet
Ratchet, Brace.
Auger Bit.
Drawing Knife.
Rose Countersink.
Set Twist Drill Bits.
FACE
BACK OF TONGUE
FACE
BACK OF BODY
Stanley Steel Square
Eight-inch T. Bevel.
Combination Carborundum Stone.
Saw Set.
Handy Saw
No92
Divider.
Jack Plane.
Flat Bastard Mill File
Slim Taper Triangular File.
Two-Foot. Four Foot Rule.
Try Square
Socket Firmer Chisel
Coping Saw.
Putty Knife.
Screw Driver
Combination Plier.

INTRODUCTION

A shop containing a workbench and tools on every farm is necessary not only to keep the farm equipment in order but as a place and means for the boys to tinker at such work as suits their fancy.

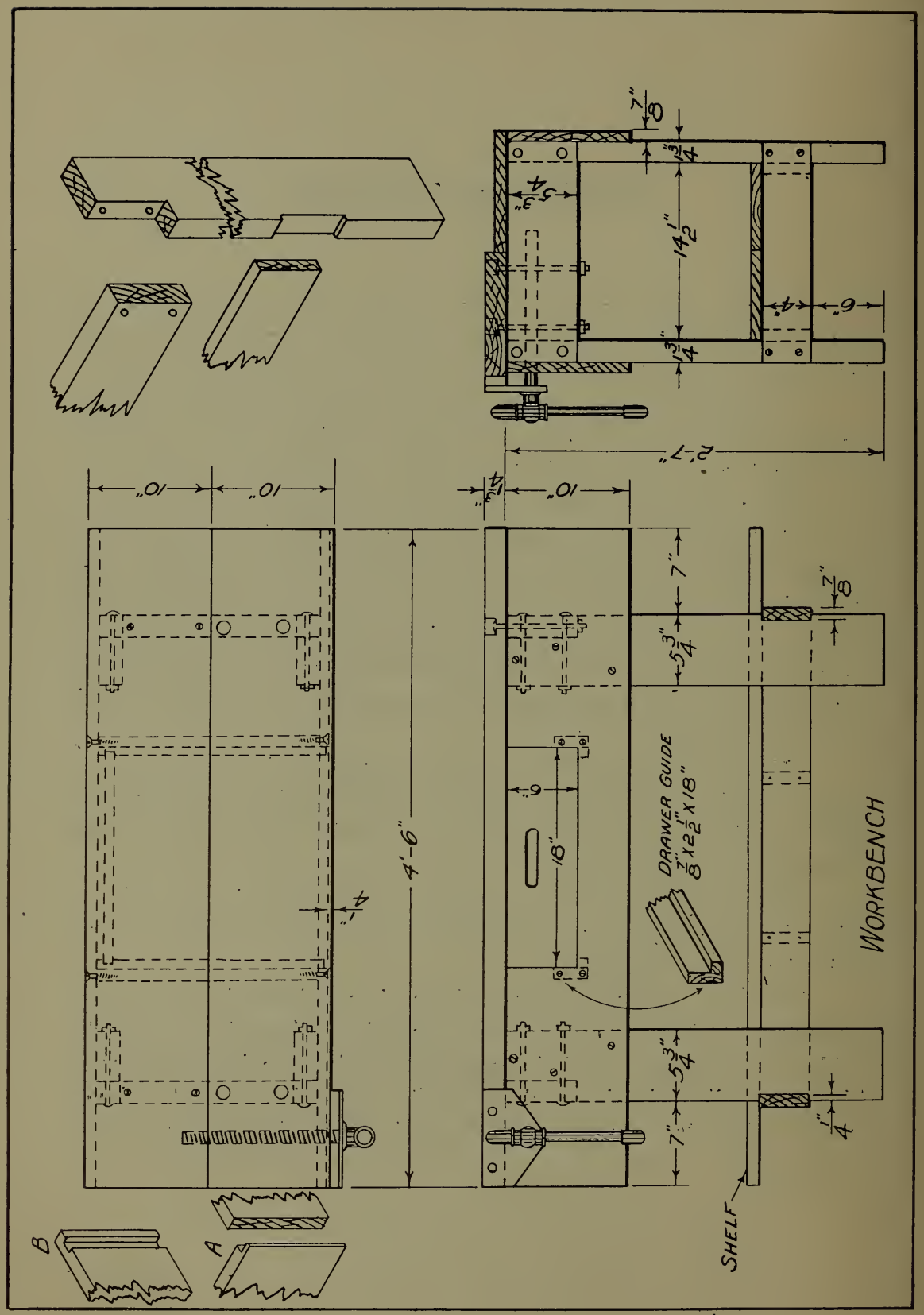
A workbench and a kit of tools are desirable equipment for the schools that the older boys may receive training to do construction and repair work and satisfy their desire to work with tools.

The workbench herein suggested is suited to do the kind of work indicated by the appliances on the following pages. It is suggested that the teachers and school boards who desire to have this work in their schools do not depend on the boys to construct the benches for the school but rather hire a carpenter to do the work. *After* the boys have done considerable of the work constructing the appliances it may be desirable to have them build benches for their own use at home.

"Manual Training for the Rural Schools" is a collection of usable appliances especially adapted to the needs of rural people. The material required is such as may be obtained at the local lumber yards and hardware stores.

Effort has been made to arrange the problems in the order of difficulty of construction, placing the ones which are easier of construction at the beginning.

The first and most important lesson in woodwork is to learn how to reduce a piece of wood to the three given dimensions of length, width and thickness and it is suggested for those beginning the work that they follow closely the direction for "Reducing Stock to Dimensions," observing closely the illustrations of the tool operations referred to.


WORKBENCH
DRAWER GUIDE
7/8" X 2 1/2" X 18"
4'-6"
18"
SHELF
A
B

WORKBENCH

The material required for the workbench is as follows:

Lumber:

Pieces	Dimensions	Use
4	1¾″x5¾″x2′-7″	Legs
2	1¾″x5¾″x18″	Sills
2	⅞″x4″x18″	End braces
2	⅞″x4″x3′-3½″	Long braces
2	⅞″x4″x12¾″	Cross braces
2	⅞″x7¼″x4′-6″	Shelf
2	⅞″x10″x4′-6″	Aprons
2	⅞″x2½″x18″	Drawer guides
2	⅞″x⅞″x18″	Drawer guides
1	⅞″x6″x18″	Drawer front
2	⅞″x6″x18⅝″	Drawer sides
1	⅞″x5″x17″	Drawer back
2	½″x½″x16¼″	Drawer bottom rests
2	½″x9″x16¼″	Drawer bottom
1	1¾″x10″x4′-6″	Top plank
1	⅞″x10″x4′-6″	Top board

Hardware:

8 Carriage bolts, ⅜″x6″, with washers to hold sills to legs.
4 Carriage bolts, ⅜″x7″, with washers to hold top plank to sills.
3 doz. 1¾″ flat head wood screws.
3 doz. 6d common nails.
2 doz. 3d common nails for drawer guide, floor and floor rest of drawer.
2 doz. 8d finishing nails for assemblying drawer.
1 Iron screw vise.

Directions.

1. Measure, cut and plane all pieces to the dimensions called for in the bill of material.

2. By use of the hand saws cut a 1¾″x5¾″ shoulder at the upper end of each leg as shown in the detail drawing; then cut gains ¼″ deep by 4″ wide at 6″ from the bottom ends of the legs on the same edges as the shoulders for the braces; then fasten the braces with screws and bolt the sills to the legs.

3. Fasten the long braces to the legs, using five 6d common nails at each end of each brace. In nailing the braces in place be sure and use the steel square and make the legs stand at right angle to the braces.

4. Fasten the cross braces in place, using two 6d common nails at each end of each brace, then nail the shelf in place.

5. Fasten the aprons to the legs using six screws for each apron.

6. Cut the opening in the front apron for the drawer 6″x18″, then fasten the drawer guides in place, using two screws at each end of each guide.

7. The drawer front is cut as shown in detail drawing A; the drawer back is set into the drawer sides as at B; the bottom rests on the ½″x½″ cleat which is nailed to the inside of the sides at bottom as in the construction of the drawer guides.

8. Cut a hand hold in the drawer front 1″x4″, using the 1″ auger and a chisel.

9. The top board is held to the sills with screws. The top plank is fastened to the sills with the ⅜″x7″ carriage bolts. ⅞″ holes are bored 1″ deep in the top plank so as to allow the heads of the bolts to drop below the surface. These holes are plugged when the bolts are in place. The top plank is allowed to project over the edge of the front apron ¼″ so as to serve better as a vise jaw.

10. Vises vary so in design and dimensions that the workman needs to study the way of fastening the vise at hand.

DIRECTIONS FOR REDUCING STOCK TO DIMENSIONS

1—Plane one side smooth and mark "I." Call this side the working face. Fig. 1.

Fig. 1. Holding Wood Between Bench Pegs and Planing Surface.

Fig. 2. Edge Planing.

2—Plane one adjoining edge at right angles to surface "I" and mark "II." Call this edge the working edge. Fig. 2.

3—Draw a line across surface "I" near one end at right angles to surface "II," and remove the end stock to line with saw or plane. Mark end surface "III." Call this end the working end. Fig. 3, Fig. 4.

Fig. 3. Squaring the End with Try Square and Pencil.

4—Measure off the length of the required piece on surface "I" from the end surface "III," and reduce stock to length with saw or plane. Fig. 4.

Fig. 4. Sawing Cross Grain on Bench Hook with Back or Handy Saw.

Fig. 4a. End Planing with a Block Plane.

4a—The end may be trimmed with a block plane as shown. Fig. 4a.

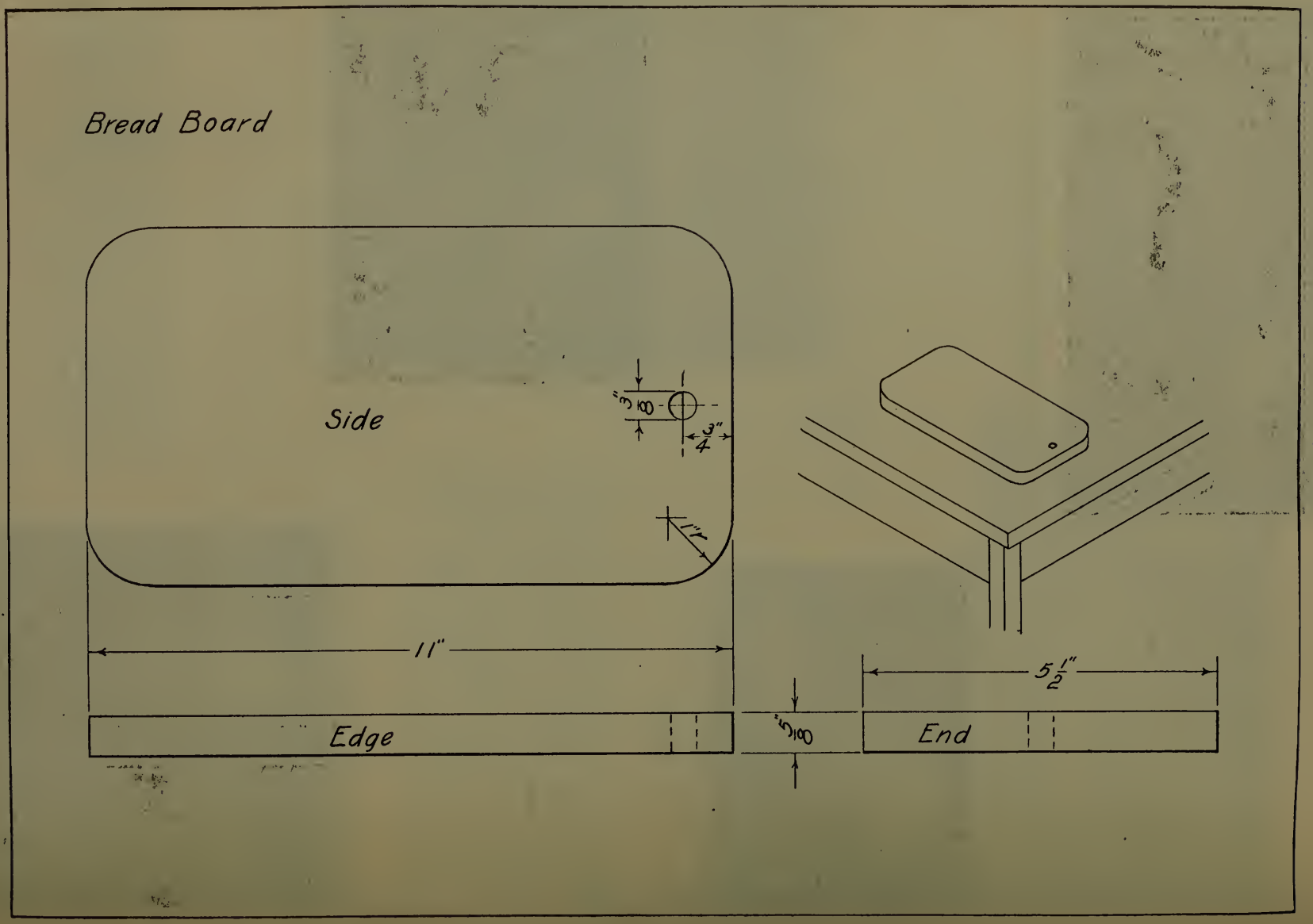
5—Measure off the width of the required piece on surface "I" from edge "II" and remove stock to line with plane.

6—With marking gauge set at the thickness of the required piece, measure off the thickness of the required stock from surface "I" and remove stock to line with plane. Fig. 5.

Fig. 5. The Marking Gauge in Use.

Fig. 6. Testing to See if End is Square with the Edge.

6—In reducing a piece of wood to dimensions the try square should be used constantly, to obtain right angles with the adjoining surfaces. The stock should be removed to the line but the line should never be cut away. Fig. 6.


Bread Board
Side
3/4"
11"
11"
Edge
5/16"
5 1/2"
End

BREAD BOARD

Material Required

Lumber: 1 piece basswood, poplar or white pine $\frac{13}{16}$ x 5⅝ x 11½ inches.

Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace, ⅜ inch bit, ¾ inch chisel, marking gauge, dividers.

Stock Bill

Pieces.	Finished Dimensions.
1.	⅝x5½x11 inches.

Fig. 7. Swinging an Arc with a Compass.

Fig. 8. Chiseling with the Grain.

Directions

1—Reduce stock to finished dimensions following the above directions.

2—To lay out round corners locate points at each corner on both sides 1 inch from end and 1 inch from edge, and with dividers set at a 1-inch radius swing an arc across the corner to edge and end. Fig. 7.

3—Draw a line across edge and end at each corner 1 inch from the corner so that the proper amount of stock may be removed.

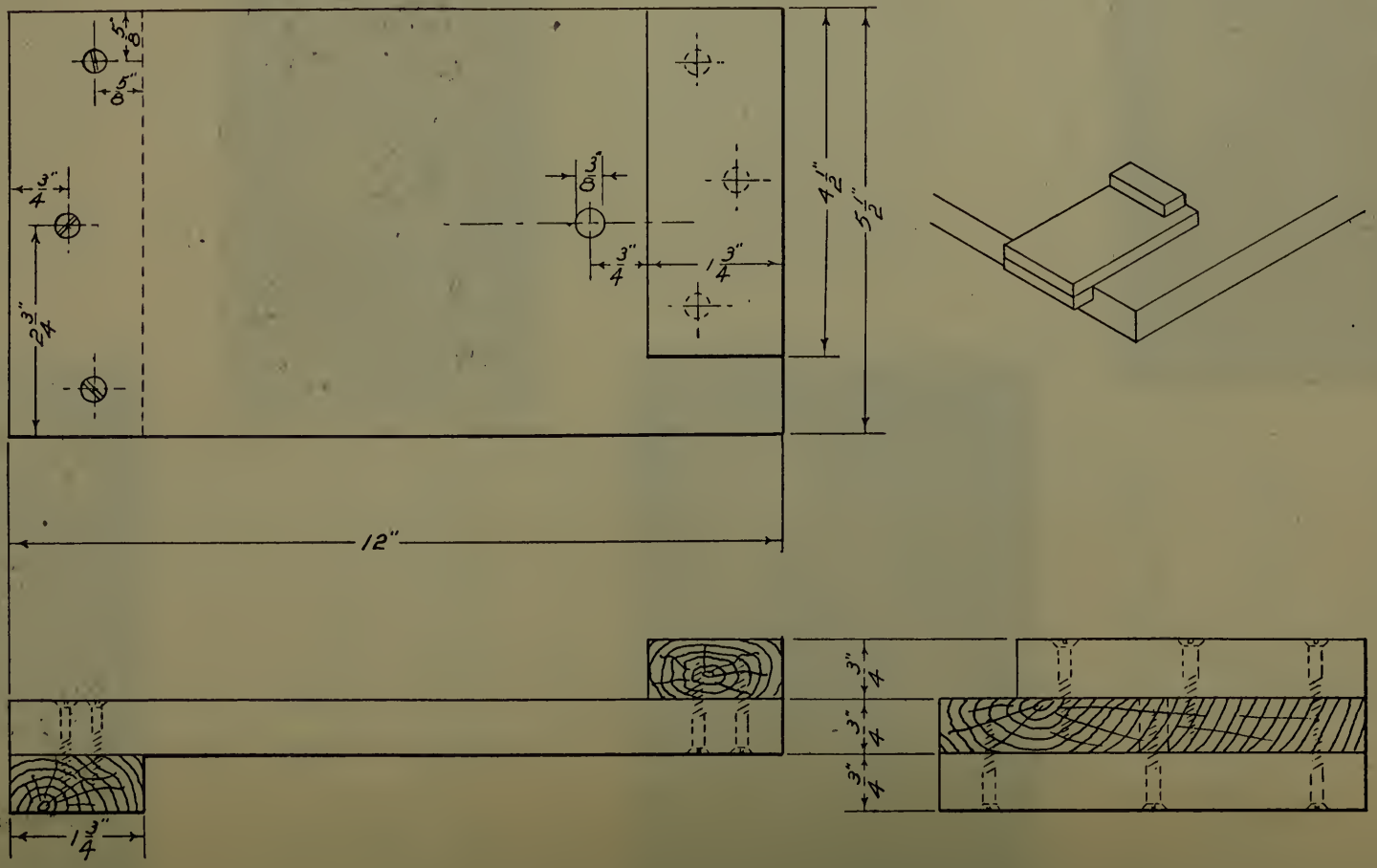
4—Remove stock at corner with ¾ inch chisel, cutting with the grain. Fig. 8.

Fig. 9. Boring a Hole.

Fig. 10. Feeling for the Point of the Bit.

5—Locate a point ¾ inch from one end on a center line drawn lengthwise of the stock and bore hole with ⅜ inch bit. Bore from one side until the point of the bit comes through, then turn the board and finish from the other side. This prevents splitting of the wood around the hole. Fig. 9, Fig. 10.

Bench Hook



BENCH HOOK

Material Required

Lumber: 1 piece white or yellow pine, $\frac{13}{16}$x5$\frac{5}{8}$x10$\frac{1}{2}$ inches.
1 piece white or yellow pine, $\frac{13}{16}$x1$\frac{7}{8}$x11 inches.
(Cypress or Oregon pine may be substituted for white or yellow pine.)

Hardware: 6 flat head bright wood screws 1$\frac{1}{4}$ inch, No. 8.

Fig. 12. Setting a Plane.

Directions

1—Reduce all pieces to finished dimensions.
2—Draw a center line lengthwise of big piece.
3—Locate a point on line just drawn 2$\frac{1}{4}$ inches from one end and bore $\frac{3}{8}$ inch hole.
4—Locate points on each of the small pieces for screws.
5—Bore holes for screws with $\frac{5}{32}$ inch twist bit and countersink the holes.
6—Clamp all pieces accurately in position in vise and assemble with screws. If white pine or other soft wood is used the screws may be forced into the large piece without drilling a hole, but if yellow pine or other hardwood is used a hole should be made for starting the screw with a smaller bit than that used for the shank of the screw.
The screw driver should be held straight and pressed firmly so as not to mar the slot in the screw.
The hole for the head of the screw should be countersunk so that the head is slightly below the surface of the wood.

Fig. 11. Position to Hold Sand Paper and Sand Paper Block.

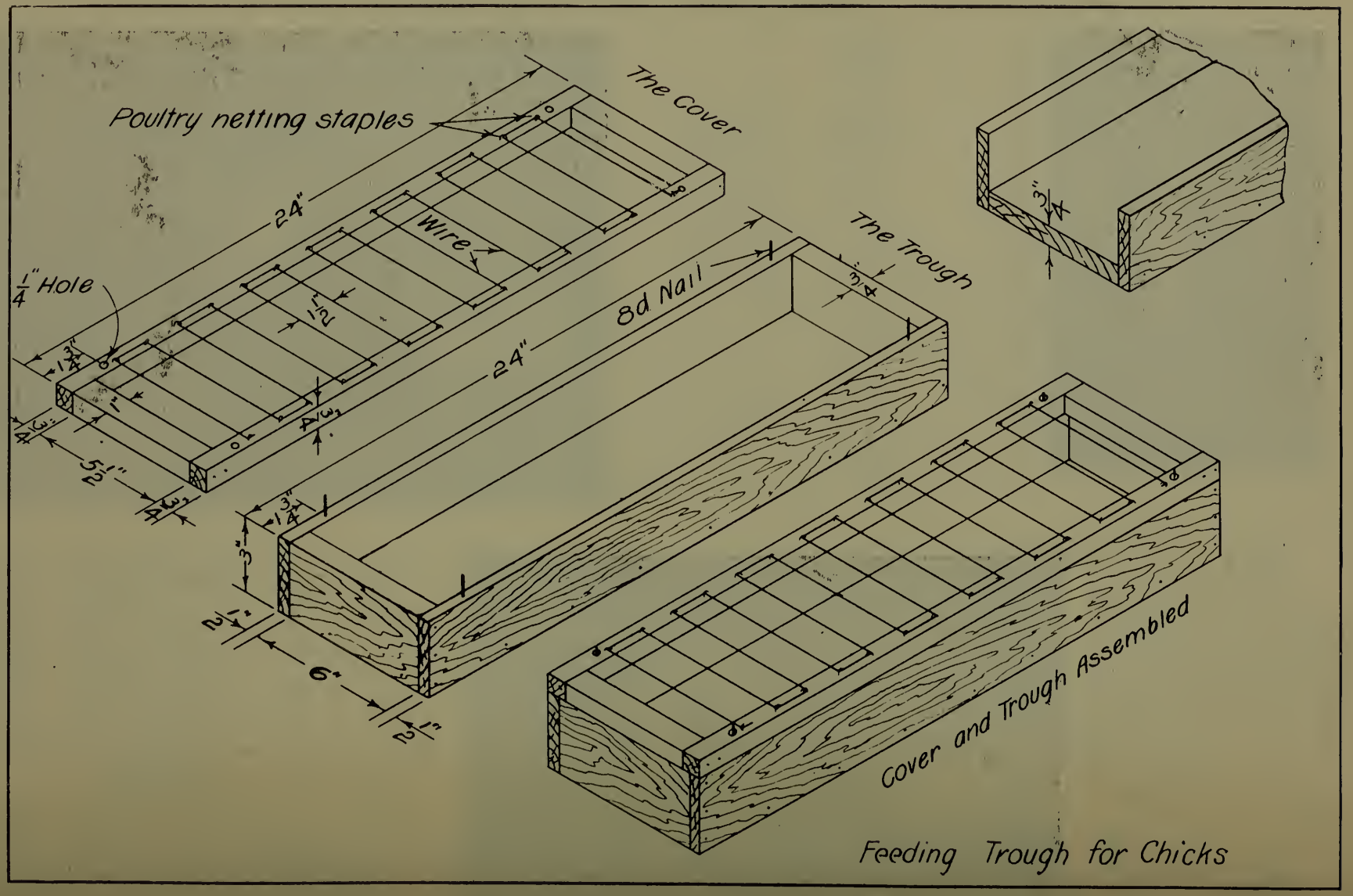
Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace, $\frac{3}{8}$ inch bit, No. $\frac{5}{32}$ inch twist drill, countersink, screw driver.

Stock Bill

Pieces	Finished Dimensions
1	$\frac{3}{4}$x5$\frac{1}{2}$x10 in.
1	$\frac{3}{4}$x1$\frac{3}{4}$x 5$\frac{1}{2}$ in.
1	$\frac{3}{4}$x1$\frac{3}{4}$x 4$\frac{1}{2}$ in.

Fig. 13. Countersinking a Hole.


Poultry netting staples
The Cover
24"
Wire
1/4" Hole
1 3/4"
1 1/2"
1"
3/4"
5 1/2"
4 3/4"
The Trough
3/4"
8d Nail
24"
3"
1 3/4"
3"
2 1/2"
6"
2 1/2"
3"
Cover and Trough Assembled
Feeding Trough for Chicks

FEEDING TROUGH FOR CHICKS

A poultry feeding device should be designed so that it is easy to fill, easy to clean and minimizes the tendency of the chicks to waste feed. The trough shown here is cleaned by merely lifting the cover from the box and using a hose or a pail of water and a broom.

The cover is made of pieces of wood ¾"x¾" for the sides and ¾x1" for the ends. This makes the inside edges of the cover project over the inside edges of the sides and ends of the box. This slight projection catches the feed which the chicks tend to flip out and causes it to drop back in.

The wires prevent the birds from getting on the feed and scratching. Following is a bill of material:

Pieces	Dimensions	Use
1	¾"x6"x22½"	Bottom
2	½"x3"x24"	Sides
2	¾"x3"x6"	Ends
2	¾"x¾"x24"	Sides of cover
2	¾"x1"x5½"	Ends of cover

3 doz. 4d finishing nails for assembling the box.
12 8d finishing nails for assembling the top and holding the cover in place
28 poultry netting staples.
7 ft. of heavy wire (hay wire will do if none heavier is at hand).
Small quantity of paint.

Directions for Construction

1. Reduce all pieces to the dimensions called for in the bill of material.

2. Fasten the ends to the bottom of the trough by using four 4d finishing nails at each end.

3. Fasten the sides of the trough to the bottom by using 4d finishing nails spaced as shown in the drawing.

4. Drive four 8d finishing nails part way into the top edge of the sides of the trough at points 1¾" from the ends. Allow the heads of the nails to project about one inch.

5. Nail the sides of the top to the ends by using two 8d finishing nails at each joint.

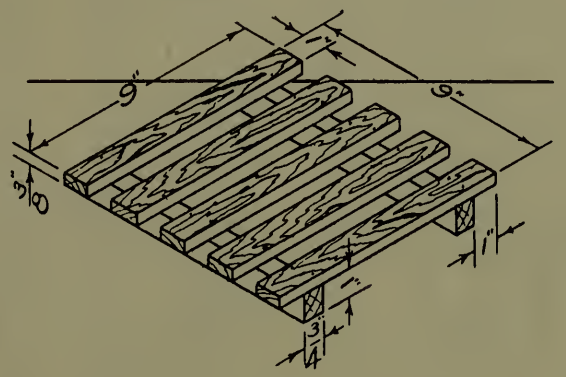
6. Place the wire on the cover as shown in the drawing of the cover, spacing the wires 1½" apart. The poultry netting staples are used to hold the wire.

7. Bore ¼" holes through the side pieces of the cover at points 1¾" from the ends. The cover may then be placed on and off as desired for filling and cleaning the trough.

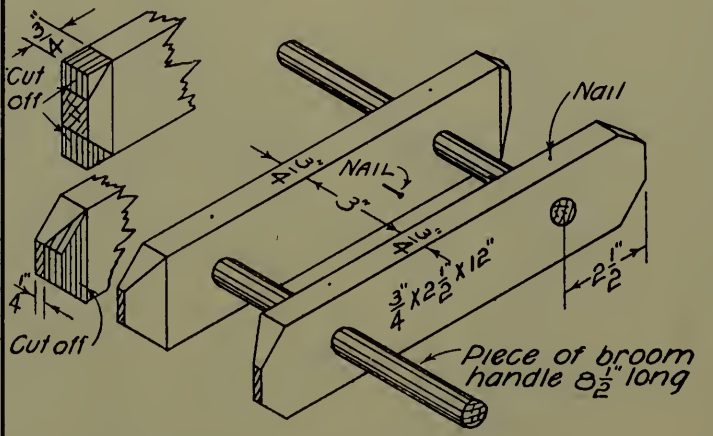
8. Set the nails slightly with the nail set.

Note: If the chicks are too small to reach the feed, an inch board or a piece of two by four may be placed alongside the trough for the first few days.

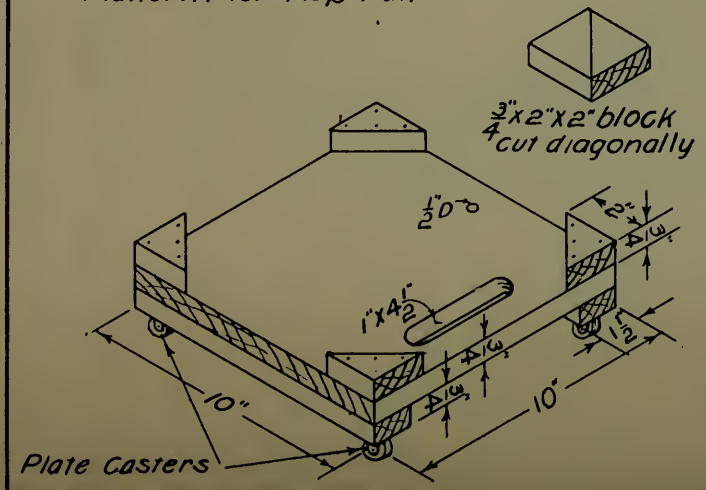
Stand for Hot Dishes



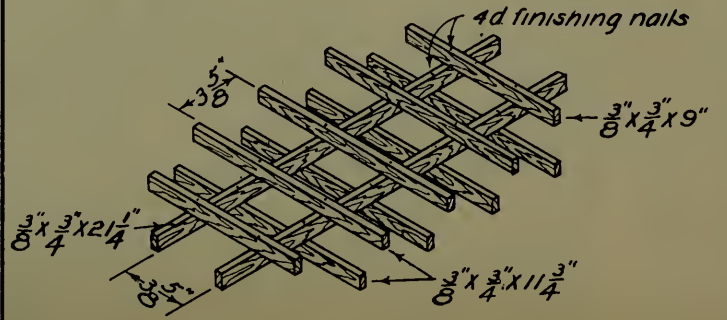
Clothes Line Reel



Platform for Mop Pail



Fruit Can Rack



This rack is for pint cans and a wash boiler 12" x 22 1/2".

STAND FOR HOT DISHES

The stand for hot dishes may be constructed of any soft wood. The sills are ¾″x1″x9″. The slats are ⅜″x1″x9″ and are fastened to the sills by driving two 4d finishing nails through the slats and into the sills from the top. The nails are set with the nail set so as not to catch the cloth while cleaning.

CLOTHES LINE REEL

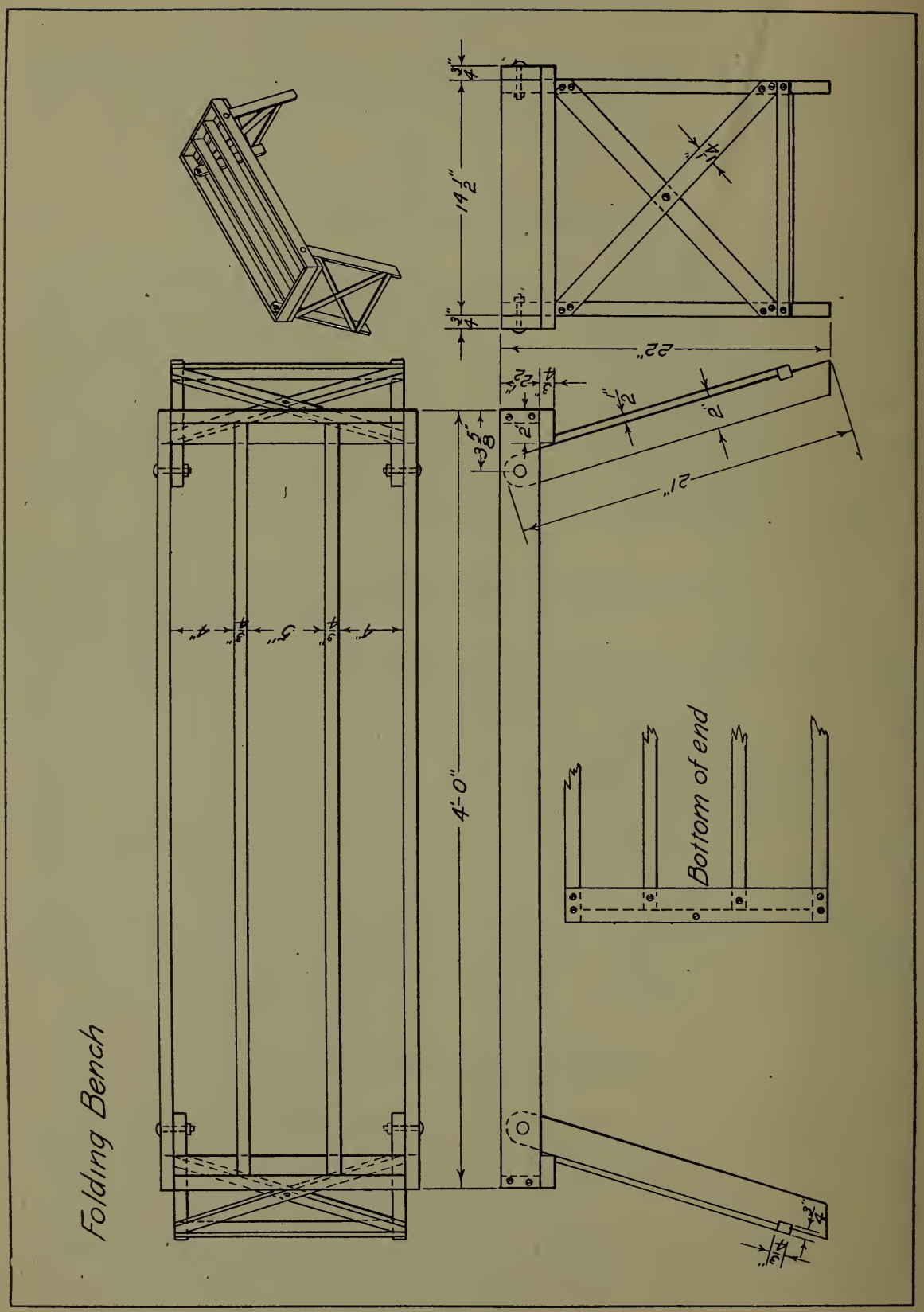
After the two main pieces of the reel are reduced to the size called for in the drawing, all corners are chamfered ¾″ as shown in the detail drawing. The inside edges of the ends are then chamfered ¾″ back on the side and to a ¼″ point. Pieces are cut from an old broom handle 8½″ long and used for handles. They are placed 2½″ from the ends. The handles are held in place with nails driven into the edges of the main pieces. 3d nails are suitable. A 4d common nail driven part way in on the inside of one of the main pieces is a means of fastening the end when starting to wind up the line.

PLATFORM FOR MOP PAIL

The platform for a mop pail is a labor saving device for the kitchen. The platform with a pail on it may be pushed from place to place on the floor without being lifted each time. It consists of a board ¾″ thick and 10″ square, held straight by two ¾″x1½″x10″ wooden straps nailed below at each end. Two ¾″x2″x2″ blocks are sawed diagonally as shown in the detail drawing, making four triangular blocks, one being nailed to each corner at the top. This prevents the pail from slipping off the platform when pushed or pulled from place to place on the floor. Four plate casters are fastened to the bottom of the platform at the corners. A 1″x4½″ hand hold is made in the platform, as shown, by use of the inch bit and the wood chisel. A ½″ hole is bored through the platform as shown to hang it up on a nail when not in use.

FRUIT CAN RACK

The fruit can rack is a handy device for holding the fruit cans in an upright position in an ordinary wash boiler so as not to touch one another while canning. ⅜″x¾″ strips of wood are used and are held together with 4d finishing nails. The nails are driven through from the top and clinched. This rack as dimensioned is for pint cans and a wash boiler 12″x22½″. Before starting the construction, the maker should measure the boiler that is to be used and the cans that are to be filled. Then cut the pieces to length and space them to accommodate the sizes of cans at hand. It may be noted that this rack as dimensioned will hold in place twelve pint cans.


Folding Bench
14½"
22"
12"
4'-0"
Bottom of end

FOLDING BENCH

Material Required

Lumber: 1 piece cypress or white pine $\frac{13}{16}$x8 inches x 9 ft. 6 inches.
1 piece cypress or white pine ½x1¼ inches x 7 feet.
(Oregon pine or Southern pine may be substituted for cypress or white pine.)

Hardware: 30 flat head bright wood screws 1¾ inches, No. 10.
16 flat head bright wood screws 1 inch, No. 7.
4 carriage bolts and washers ⅜x2 inches.

Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace, ⅜ inch bit, $\frac{3}{16}$ inch and ⅛ inch twist drills, countersink, ¾ inch chisel, rip saw, screw driver, pliers, dividers.

Stock Bill

Pieces	Finished Dimensions	Use
2	¾x2½x 4 feet 0 inches	Sides
2	¾x2½x 3 feet 10½ inches	Platform
2	¾x2½x14½ inches	Ends
4	¾x2 x21 inches	Legs
2	¾x2 x16 inches	End cross piece
2	¾x ¾x14½ inches	Lower cross piece
4	½x1 x21 inches	End braces

Directions.

1—Reduce all pieces to finished dimensions.

2—Fasten ends to four long pieces by using two 1¾ inch No. 10 screws at each joint. Bore holes for screws with $\frac{3}{16}$ inch twist bit and countersink holes.

3—Fasten end lower cross piece by placing five screws as shown in the drawing.

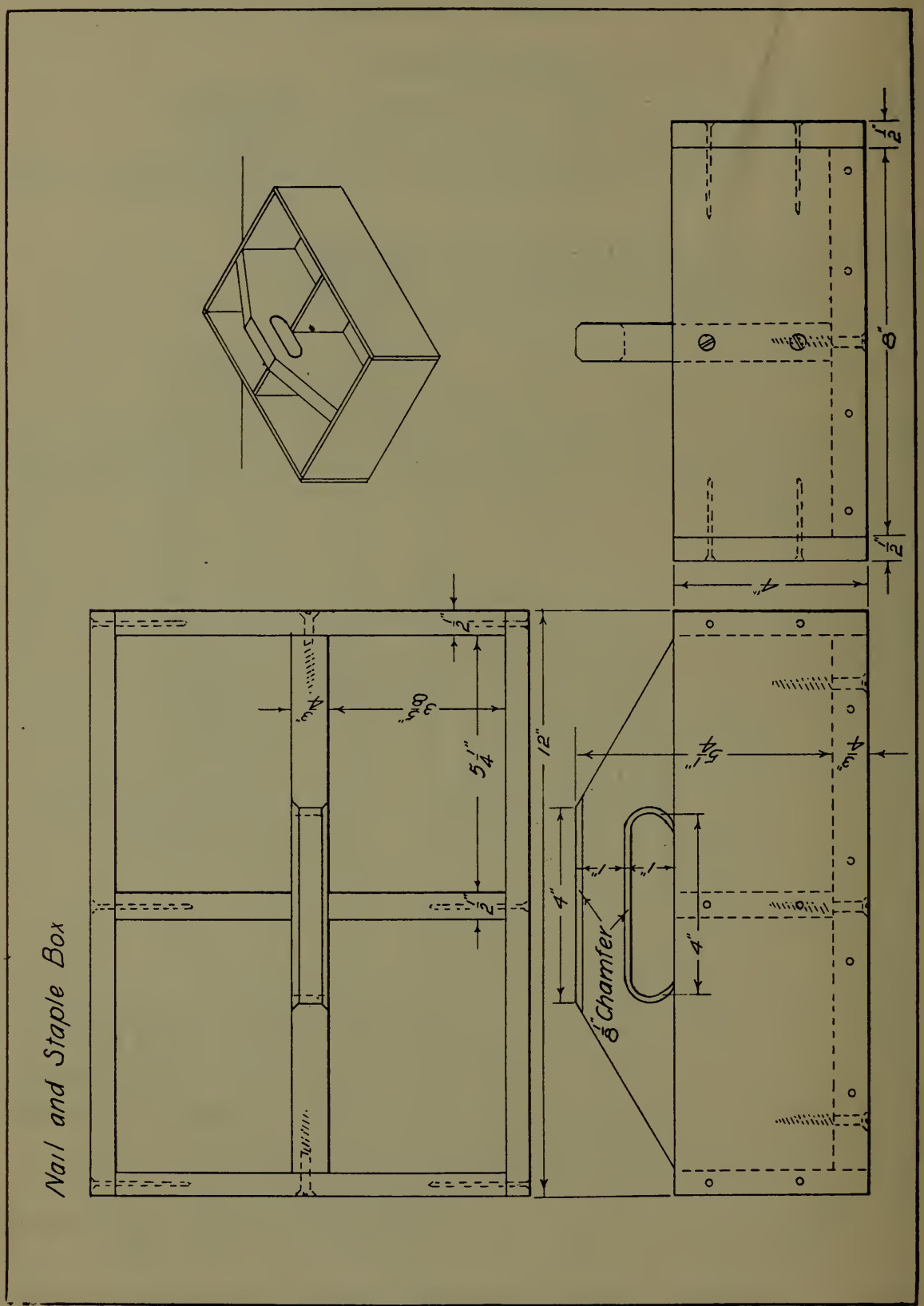
4—Locate points for bolts on side pieces 1⅛ inches from top edge and 3⅝ inches from end and bore hole with ⅜ inch bit.

5—Bore ⅜ inch holes in legs at end for bolts.

6—Cut notch ¼ inch deep and ¾ inch wide in upper edge of legs 2 inches from end and fasten cross piece in place with one 1¾ inch screw at each joint.

7—Lay out cross braces, making half lap joint at center and fasten with two 1 inch No. 7 screws at each joint, and one ⅜ inch screw at half lap joint.

8—Fasten legs to top with bolts.


Nail and Staple Box
1/2"
8"
1/2"
4"
1/2"
3 3/8"
5 1/4"
12"
5/8"
4 3/8"
1"
1"
4"
4"
1/8" Chamfer

NAIL AND STAPLE BOX

Material Required

Lumber: 1 piece white pine or basswood $\frac{13}{16}$x8¼x11½ inches.
1 piece white pine or basswood $\frac{13}{16}$x5½x11½ inches.
1 piece white pine or basswood ½x4 inches by 4 feet 2 inches.
(Redwood, poplar or cypress may be substituted for white pine or basswood.)
Hardware: 5 flat head bright wood screws 1½ inches, No. 8.
3 dozen 4d finishing nails.

Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace and $\frac{5}{32}$ inch twist drill, countersink, 1 inch bit, screw driver, hammer, ¾ inch chisel.

Fig. 14. Holding the Plane at an Angle to Cut a Chamfer.

Stock Bill

Pieces	Finished Dimensions	Use
1	¾x8 x11 inches	Bottom
1	¾x5¼x11 inches	Partition and handle
2	½x4 x12 inches	Sides
2	½x4 x 8 inches	Ends
2	½x3¼x 3⅝ inches	Cross partitions

Directions

1—Reduce all pieces to finished dimensions.
2—To lay out opening for hand draw a line lengthwise of stock 1½ inches from upper edge, also draw a center line crosswise of stock. Measurements should be made on line running lengthwise of stock from center line. Locate points on line 1½ inches from center line and bore 1 inch holes. Remove as much as possible of the remaining stock with 1 inch bit and trim opening with ¾ inch chisel.
3—In making partition and handle first reduce piece to ¾x5¼x11 inches. To lay out the slant draw two lines across upper edge 3½ inches from ends and a line across each end 2 inches from upper edge. Connect lines just drawn with lines on both sides.
4—Lay out ⅛ inch chamfer on upper edge and both ends of opening with pencil and remove stock with chisel.
5—Remove stock for slant with saw and trim to line with plane.
6—Lay out ⅛ inch chamfer on corners of upper edge and remove stock with plane.
7—Assemble box by placing nails and screws as shown in drawing.

FIG. 1

WREN HOUSE

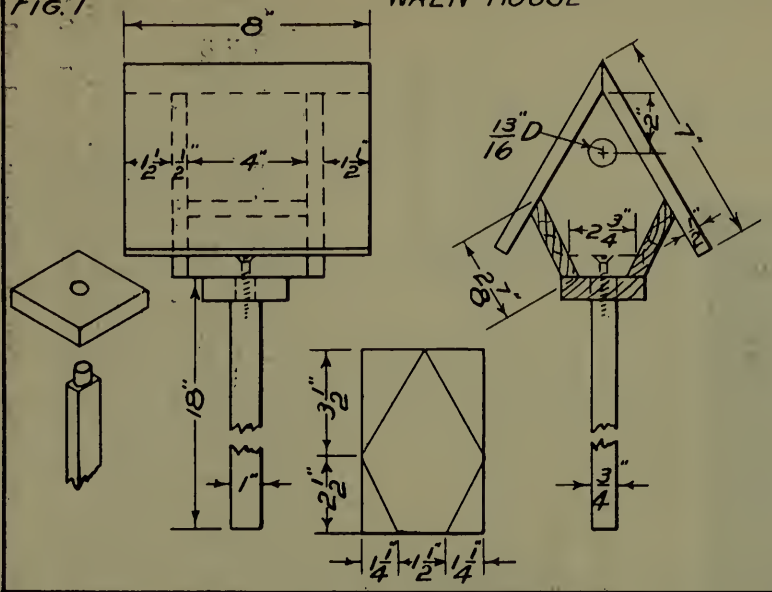


FIG. 2

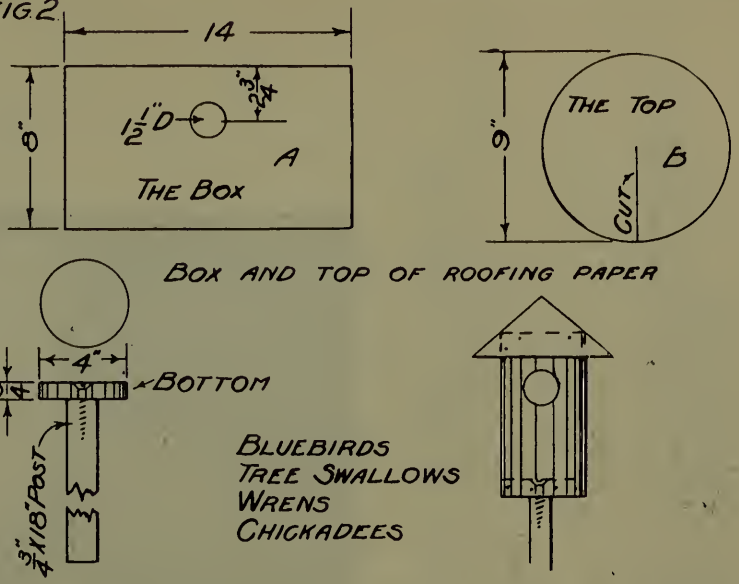


FIG. 3

HOLLOW LOG FOR ANY BIRD TO BE HUNG ON TREE OR POST

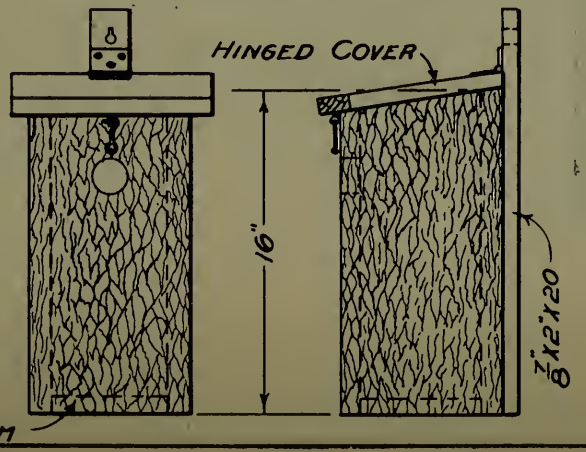
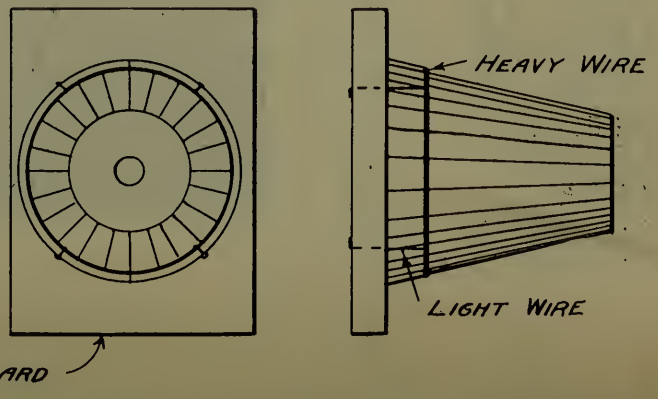


FIG. 4

FLOWER POT FASTENED TO BOARD AND TO TREE OR POST



BIRD HOUSES

The materials best suited for bird houses are weathered boards, slabs of wood with the bark adhering, roofing paper, plant pots and hollow logs, because they most nearly resemble the natural nesting places of birds. If new lumber is used, it need be painted to preserve it and may then be covered with slabs of bark to make a rustic appearance.

The inside measurements of a box should be at least 4″x4″x6″. A medium sized box will be acceptable to the greatest variety of birds.

Since all birds, except the martins, wish to be out of sight while incubating the opening in the house should be placed above the center. If the house is intended for whatever bird may choose to live in it a 1½″ opening is preferable. If the house is built for a particular bird the following sizes of openings as suggested by H. K. Job of the Audubon Society are recommended:

1⅛″—House wren, Bewick's wren, Carolina wren, chickadee.
1¼″—White-breasted nuthatch, tufted titmouse.
1½″ to 1⅝″—Bluebird, downy woodpecker, crested flycatcher, tree swallow, violet-green swallow.
1¾″ to 2″—Red-headed and hairy woodpecker.
2½″—Flicker, saw-whet owl, purple martin.
3″—Screech owl, sparrow hawk.
4½″—Barn owl, wood duck.

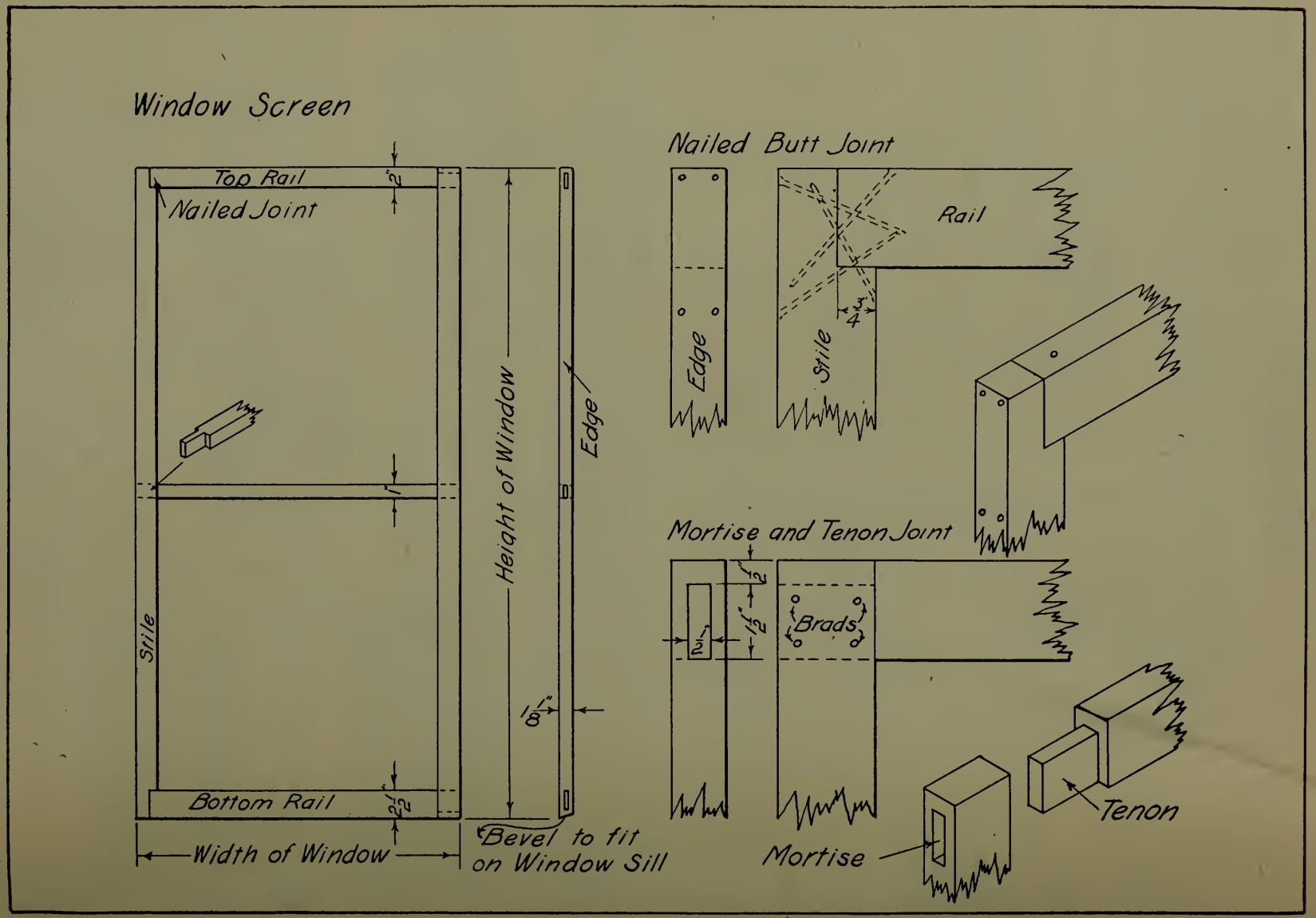
A good way to place the house is on a wooden or iron pole, five to twelve feet high. An iron pole has the advantage of preventing cats or squirrels from bothering the birds. A telegraph pole or the top of a high fence post or the top of a dead tree trunk are also good places for the house.

The wren house in Fig. 1 may be accurately built to the dimensions specified in the drawing and thus be a good construction problem as well as a good bird house. Two coats of an outside paint will act as a preservative for the wood and prevent the boards from warping and the joints from opening. Slabs of bark nailed over the outside of the house gives it an appearance more like the native haunts of the birds.

The house in Fig. 2 is built of roofing paper which is fastened to a wooden bottom or post. Patterns are laid out for the box and the roof as at A and B. The building paper is then cut to the patterns and the roof is fastened to the box while flat on the workbench. Holes are punched through the roofing paper and the parts held together with split rivets. The roof folds up in a cone shape and the joint is held with rivets.

Fig. 3 shows a piece of the trunk of a hollow tree with a round piece of board in the bottom the size of the hole. A piece of weathered board ⅞″x2″x20″ is fastened to the house at the back as a means for fastening up the house. The top of the trunk is cut at a slant. A weathered board slightly wider and longer than the top of the house is fastened to the back board with a hinge. This makes a good roof. A hook is provided to hold the roof down at the front.

Fig. 4 shows a plant pot fastened to a weathered board. The board may be fastened to a tree or the side of a building. The hole in the bottom of the pot needs to be enlarged to at least 13-16″ if intended for wrens or to the dimensions in the table if intended for other birds.


Window Screen
Top Rail
Nailed Joint
Stile
Height of Window
Edge
Bottom Rail
Width of Window
Bevel to fit on Window Sill
Nailed Butt Joint
Edge
Stile
Rail
Mortise and Tenon Joint
Brads
Mortise
Tenon

WINDOW SCREEN

Material Required for Each Window

Lumber: I piece white pine or cypress 1⅛x2½ inches by width of window for bottom rail.
1 piece white pine 1⅛x2 inches by width of window plus twice the length of window for top rails and stiles.
1 piece white pine 1⅛x1 inch by width of window for middle rail.
Enough screen moulding to cover edges of screen and middle rail.

Hardware: Twenty 10d casing nails, if nailed joint is used; I package No. 16 brads if mortise and tenon joint is used and for nailing moulding, package of carpet tacks for screen; wire fly screen; paint.

The finished dimensions are not given here as they must be obtained by measuring the window where the screen is to fit.

The mortise and tenon joint is the stronger and better way of joining the screen at the corners, yet a nailed joint holds the members firmly in place if the nails are well placed at an angle as shown in the drawing. The screen need lap only far enough on the sides and ends to be securely nailed. It should not project outside of the moulding which is placed on the inside edge of the sides and ends and across the middle rail.

The painting should be done carefully so as to prevent moisture from getting into the joints.

Fig. 15. Position of Chisel and Mallet for Mortising.

Fig. 16. Method for Holding Chisel in Mortising.

TOOL SHARPENING

There are three distinct operations in sharpening a plane bit or chisel; first, grinding, Fig. 17; second, whetting the beveled side, Fig. 18; third, removing the wire edge from the plain side, Fig. 19.

In grinding a plane iron loosen the cap screw with a screw driver and set the lever cap back on the plane iron so that it will be out of the way when removing the wire edge from the flat side.

Fig. 17. Grinding a Chisel.

The plane iron or cutter should be held on the grinder so that the edge will be a perfect right angle with the side. It should be held firmly in one position so that only one bevel will be formed. In grinding, the tool should be moved from side to side on the grinder so as to prevent wearing the stone unevenly.

In whetting the beveled side of the chisel or plane iron it should be held firmly in both hands as indicated in Fig. 18 and given three or four forward strokes, pressing the iron firmly on to the stone. Do not move the wrists for this motion. The movement should occur at the elbow and by the swaying of the body forward and back.

Fig. 18. Whetting the Beveled Side of a Chisel.

Fig. 19. Removing the Wire Edge from the Plain Side of a Chisel.

To remove the wire edge, lay the flat side of chisel or plane iron, flat on the oil stone as shown in Fig. 19 and move it back and forth three or four strokes. Under no circumstances should the end of the iron be raised or lowered so that it won't lie flat on the stone.

Until one becomes thoroughly familiar with tool sharpening the whetting of both beveled and plain sides may need to be done more than once to insure a good cutting tool.

SAW FILING

The first operation in sharpening a saw is that of jointing the saw, Fig. 20. The purpose of this is to bring all teeth to an even length. This is done by drawing a flat file across the teeth of the saw. One or two strokes is usually sufficient. The file must be held perfectly square; this may be facilitated by use of a block called a saw jointer, as shown in Fig. 20.

The second operation in saw sharpening is that of setting the saw. This consists of bending the teeth outward, one on one side, the next on the other and so on till all the teeth are bent. The set should not extend more than half the length of the tooth. For ordinary work the teeth should be set about one-third the thickness of the blade. For dry lumber the saw will require less set than for green or wet lumber.

Fig. 20. Jointing a Saw.

The third operation is that of filing the saw. In filing a cross-cut saw the point of the file should point toward the point of the saw at an angle of about 60 degrees. In filing a rip saw the file is held straight across the saw. File every tooth to a point, one-half of the filing being done from each side, being careful to stop filing a tooth when it has been brought to a point. File the entire length of the saw from one side, then reverse the saw and file from the other side. The front edge of each tooth projecting away from the filer and the back edge of the tooth next ahead, should be filed with the same stroke. Only forward strokes of the file should be used.

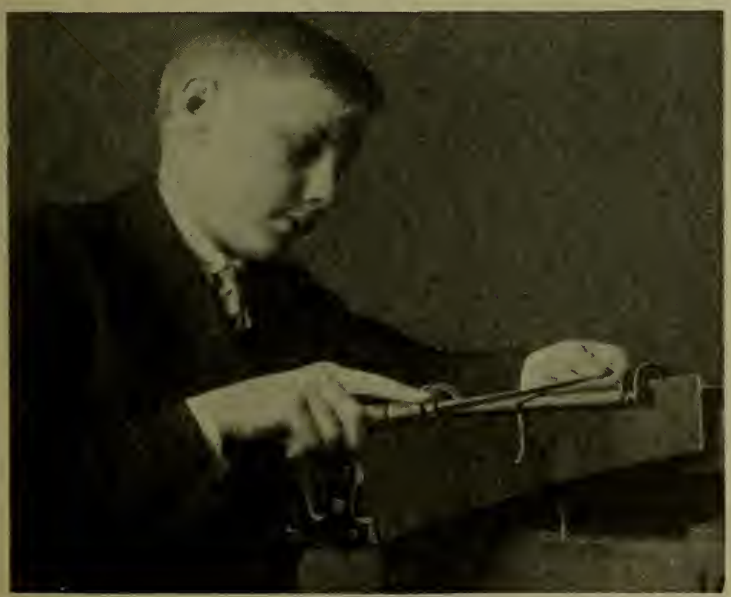
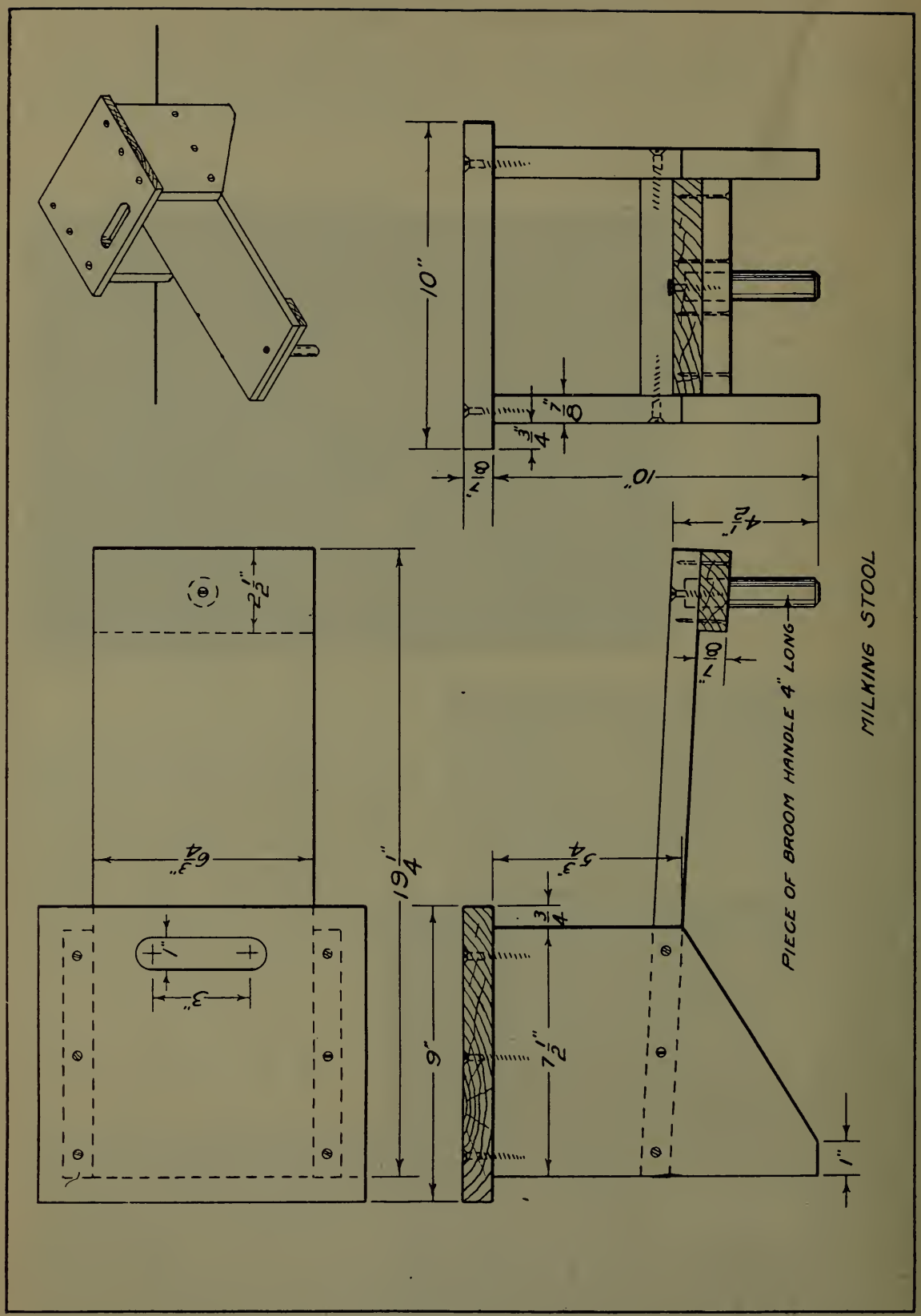


Fig. 21. Filing a Saw.

The fourth operation consists of placing the saw flat on a smooth surface, as the top of a bench, and running a flat oil stone over the teeth so as to remove the burr from the teeth caused by filing.


10"
7/8"
3/4"
7/8"
10"
4½"
7/8"
2½"
6¾"
19¼"
5¾"
3/4"
1"
3"
9"
7½"
1"
PIECE OF BROOM HANDLE 4" LONG
MILKING STOOL

MILKING STOOL

This milking stool is designed so as to have three small resting points on the floor. This is preferable to broad surfaces as the stool is more apt to set evenly on the stable floor where bedding often interferes. The bill of material for the stool is as follows:

Pieces	Dimensions	Use
2	$\frac{7}{8}''$x$7\frac{1}{2}''$x10″	Sides
1	$\frac{7}{8}''$x9″ x10″	Top
1	$\frac{7}{8}''$x$6\frac{3}{4}''$x$19\frac{1}{4}''$	Platform
1	$\frac{7}{8}''$x$2\frac{1}{2}''$x$6\frac{3}{4}''$	Brace

1 piece of broom handle 4″ long.
13 2″ No. 10 or 12 flat head wood screws.
8 4d common or finishing nails.
A small quantity of paint.

Directions

1. Reduce all pieces to the dimensions called for in the bill of material.

2. Draw a line across one end of each side piece, 1″ from the back edge. This end is to be the lower end.

3. Draw a line across the front edge of each side piece $5\frac{3}{4}''$ from the upper end.

4. Connect the lines across the edges with the lines across the ends by drawing lines across the sides.

5. Remove the stock to the lines just drawn with the saw and plane.

6. Fasten the brace to the bottom side of the platform at the front end, driving the nails through the brace and into the platform.

7. Bore a hole of the size of the broom handle through the brace at center and half way through the platform for the piece of broom handle to fit into.

8. The piece of broom handle is held in place with one of the screws. A hole is bored for the screw and the hole countersunk so that the head of the screw will fit down even with the surface of the platform.

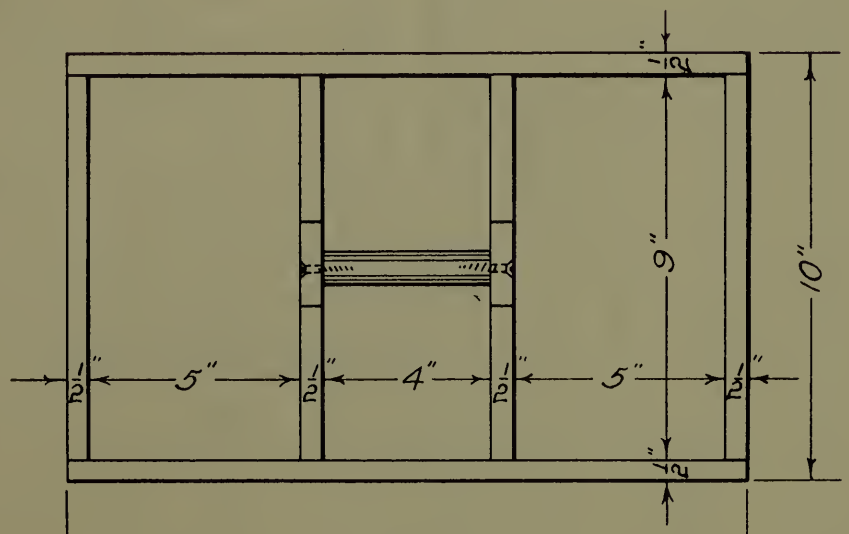
9. Make the opening in the top for the hand-hold. This is done by drawing a line parallel to the front edge of the top at $1\frac{1}{2}''$ from the edge and on the line locating points $1\frac{1}{2}''$ from the center. Bore 1″ holes at the points just located and also remove as much as possible of the remainder of the stock between the holes with the same bit. Then smooth the hole with the $\frac{3}{4}''$ or 1″ chisel.

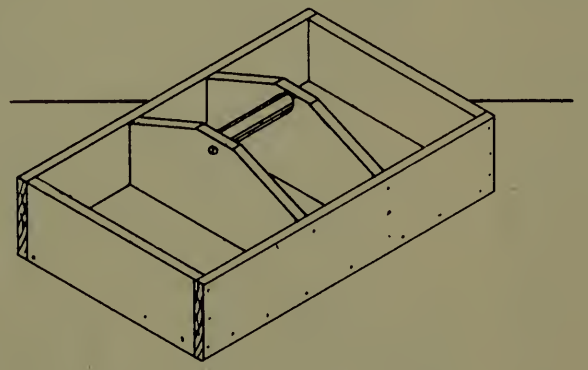
10. It should be noted that the top projects over the sides $\frac{3}{4}''$ and that it is fastened with three 2″ No. 10 or No. 12 wood screws at each side.

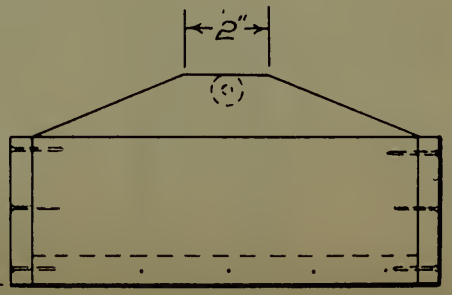
11. The platform is fastened to the sides so that its lower edge will be even with the slant on the sides at their front edges and then held in place with three 2″ No. 10 or No. 12 wood screws at each side.

12. The stool is finished by applying two coats of paint.

Farm Tool Box







FARM TOOL BOX

While repairing fences and overhauling machinery and doing other similar work on farms it is often desired to carry tools from the shop to the place where the work is to be done. The farm tool box is a handy device for carrying a few of the small tools ordinarily used. The bill of material for the box is as follows:

Pieces	Dimensions	Use
1	¾″x9″ x15″	Bottom
2	½″x3½″x16″	Sides
2	½″x3½″x 9″	Ends
2	½″x4¼″x 9″	Partitions

1 piece of broom handle 4″ long.

40 4d finishing nails.

2 1½″ No. 8 or No. 9 flat head wood screws.

Directions for Construction

1. Reduce all pieces to the dimensions called for in the bill of material.

2. Fasten the end pieces to the floor by using five 4d finishing nails at each end.

3. Fasten the sides to the floor and end pieces by using eight nails at each side at the bottom and three at each end.

4. Draw a line across each end of each partition at a point 1½″ from the upper edge.

5. Draw two lines across the upper edge of each partition 1″ from the center or 3½″ from each end.

6. Connect the lines across the edges with the lines across the sides by drawing lines on each side of each board.

7. Remove the wood to the lines with the rip saw and plane.

8. On a center line drawn across the sides of the partitions, locate points ½″ from the top edge and at these points bore holes with the 5-32″ drill for the screws.

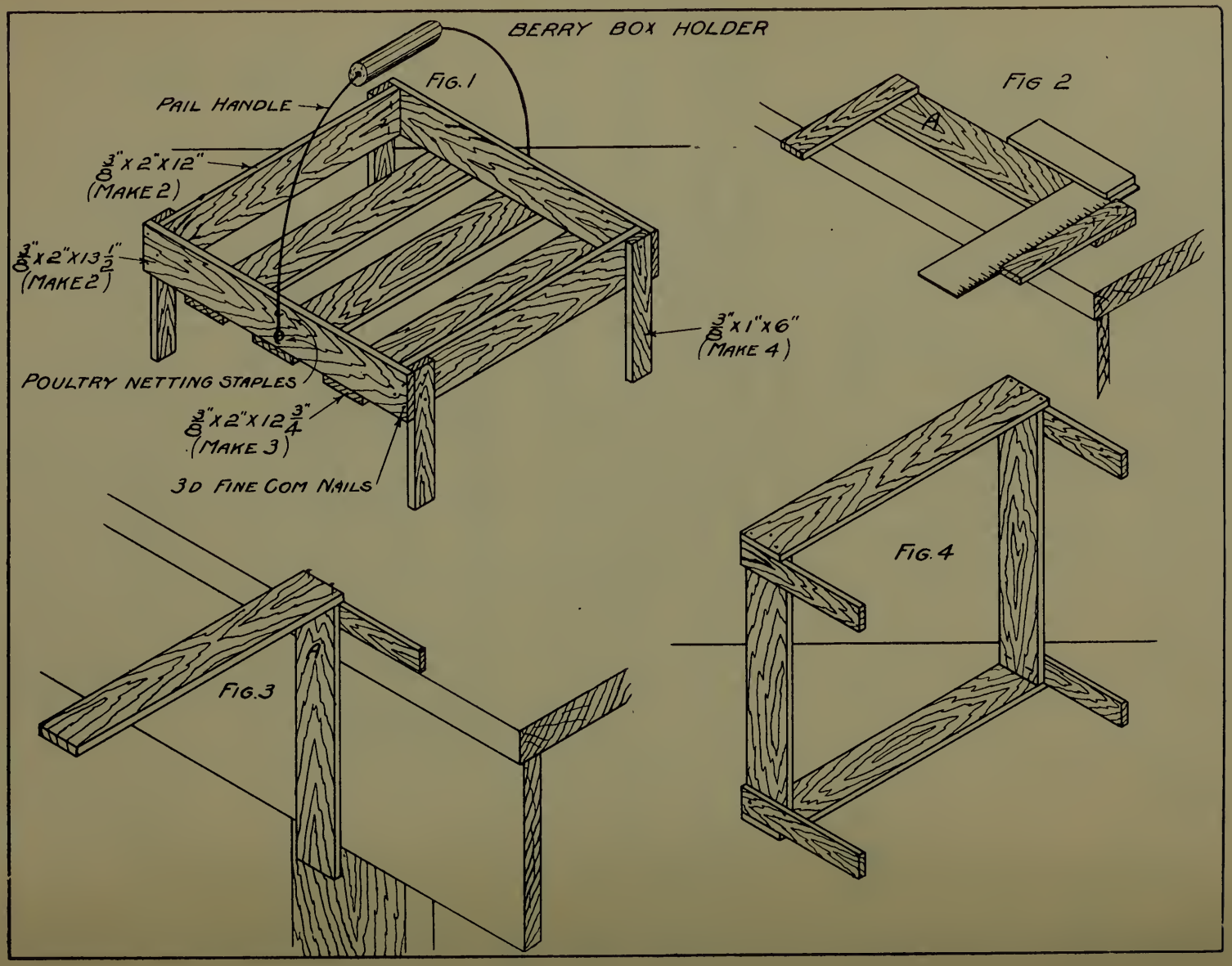
9. Countersink the holes so that the heads of the screws will fit in flush.

10. Bore holes in the ends of the handle about ½″ deep using the ⅛″ drill.

11. Fasten the handle in place before placing the partitions in the box. If the partitions were first placed in position in the box the pressure applied to the screws would be likely to split the boards.

12. Nail the partitions in place using three 4d finishing nails at each end of each board.

13. Finish the box by applying two coats of paint. Allow the first coat to dry at least two days before applying the second coat.


BERRY BOX HOLDER
FIG. 1
PAIL HANDLE
3/8" X 2" X 12" (MAKE 2)
3/8" X 2" X 13 1/2" (MAKE 2)
3/8" X 1" X 6" (MAKE 4)
POULTRY NETTING STAPLES
3/8" X 2" X 12 3/4" (MAKE 3)
3D FINE COM NAILS
FIG 2
A
FIG. 3
FIG. 4

BERRY BOX HOLDER

The berry box holder is a handy device for carrying four quart berry boxes. Lumber from dry goods boxes is suitable for the holder. After having reduced all the pieces to the dimensions called for in the drawing proceed as follows:

Place the side A on the bench as shown in Fig. 2 with a post in position as shown. Drive one nail through the post and far enough into the side A to hold it in place but not far enough to go into the top of the bench, then place the try square as shown so as to make the post fit at right angle to the side and drive the second nail. The piece A is then held so that the end projects slightly over the edge of the bench and the nails are driven through. The other post is fastened in the same way. To clinch the nails the work is turned over with the heads of the nails resting on some solid metal support and by use of the hammer the nails are bent over across the grain of the wood. The other side and two legs are then assembled in the same way.

To nail the other two sides of the box in place, one of the first two sides is placed vertically against the work bench, as shown in Fig. 3, with an edge of the leg resting on the top of the bench and two nails driven into the edge of the leg. It is then placed on the work bench or floor, as shown in Fig. 4, with the first two sides in a vertical position and one nail driven into each end.

To nail on the three floor pieces the holder is placed flat on the bench or floor with the posts up and three 3d fine common nails used in each end of each piece.

An old pail handle is most suitable for a handle. It is fastened at each end with two poultry netting staples which are placed as shown in Fig. 1. If a pail handle is not at hand, heavy wire may be used for the wire part and a piece of an old broom handle with a small hole bored through it lengthwise for the wood part. When driving the staples in place the stand is placed so that the board into which the staples are being placed will rest on the corner of the work bench or other solid surface.

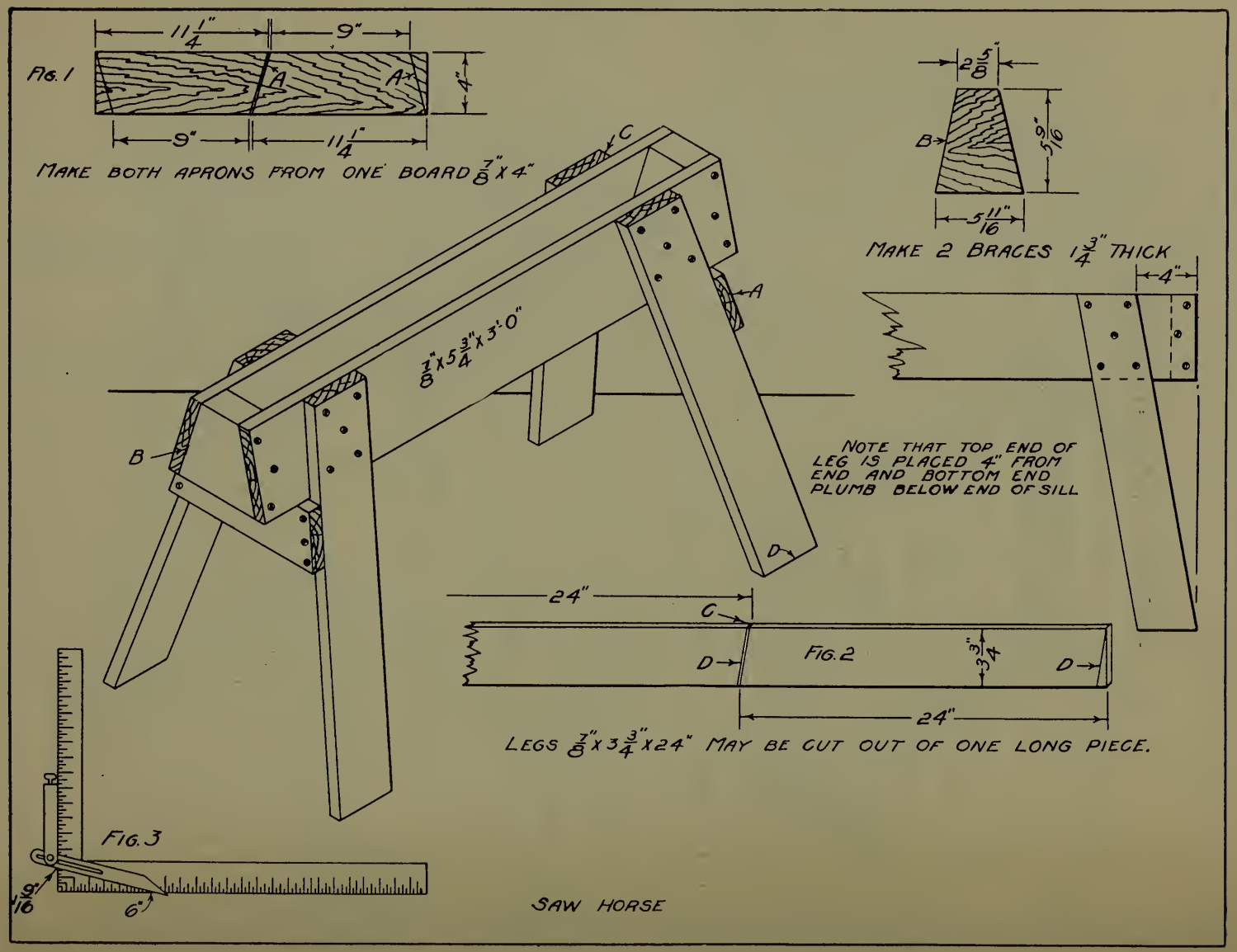


FIG. 1
11 1/4"
9"
A
A
4"
9"
11 1/4"
MAKE BOTH APRONS FROM ONE BOARD 7/8" X 4"
C
A
7/8" X 5 3/4" X 3'-0"
B
D
2 5/8"
B
5 9/16"
5 11/16"
MAKE 2 BRACES 1 3/4" THICK
4"
NOTE THAT TOP END OF LEG IS PLACED 4" FROM END AND BOTTOM END PLUMB BELOW END OF SILL
24"
C
D
FIG. 2
3 3/4"
D
24"
LEGS 7/8" X 3 3/4" X 24" MAY BE CUT OUT OF ONE LONG PIECE.
FIG. 3
9 9/16"
6"

SAW HORSE

SAW HORSE

Bill of Material

Lumber:

Pieces	Dimensions	Use
2	7/8″x5¾″x3′-0″	Sides
4	7/8″x3¾″x24″	Legs
2	1¾″x5 9-16″x5 11-16″	Braces
2	7/8″x4″x11¼″	Aprons

Hardware:

24 flat head wood screws 1¾″ No. 10 for aprons and ends.
20 flat head wood screws 1½″ No. 9 for legs.

Directions for Construction

The two aprons may be cut from one piece, as shown in Fig. 1. The legs may be cut from one long piece, as shown in Fig. 2.

The slant or angles at the ends of the aprons, braces, legs and both edges of the sides are the same and are laid out by use of the T bevel set, as shown in Fig. 3, at 6″ on the blade and 1 9-16″ on the tongue of the steel square. The cuts A, B, and C are laid out by use of the T bevel set in this way.

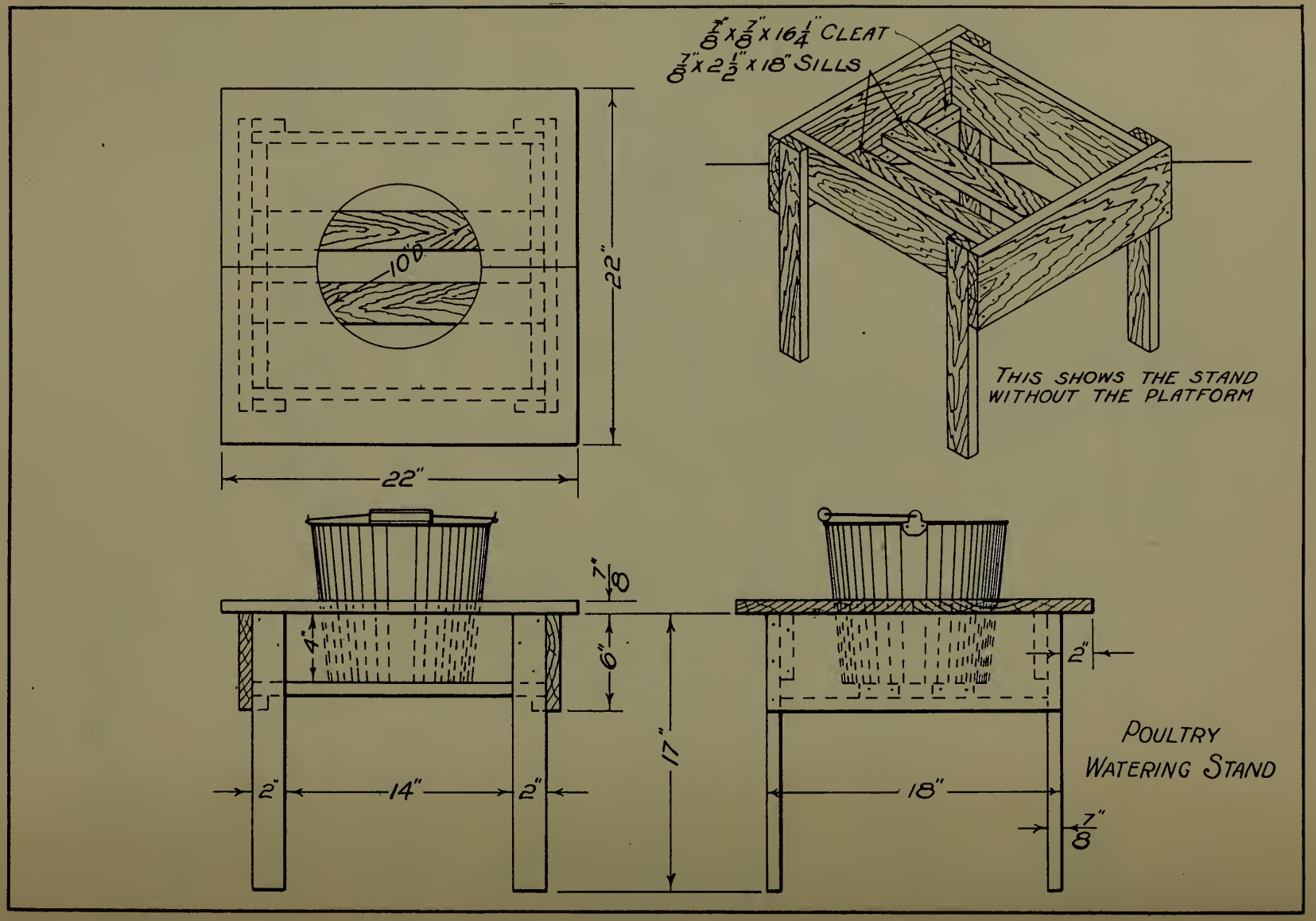
The slant or angles across the sides at both ends of the legs as at D are laid out by use of the T bevel set on the steel square as in Fig. 3 at 6″ on the blade and 1 1-16″ on the tongue.

To make the aprons fit tight against the legs, bevel the outside edges of the legs with the T bevel set at 9″ on the blade and ¼″ on the tongue of the steel square.

The sides are fastened to the braces with three 1¾″ No. 10 flat head screws at each joint. Holes are bored through the sides and the holes countersunk for the screws.

The legs are fastened to the sides with five 1½″ No. 9 flat head screws at each leg.

The aprons are placed up tight against the sides and held with three 1¾″ No. 10 flat head screws.


7/8 x 7/8 x 16 1/4" CLEAT
7/8" x 2 1/2" x 18" SILLS
10"D
22"
22"
THIS SHOWS THE STAND WITHOUT THE PLATFORM
7/8"
4"
6"
17"
2"
2"
14"
2"
18"
7/8"
POULTRY WATERING STAND

POULTRY WATERING STAND

1. What provision do you have for watering the poultry on your home farm?

2. What advantage has a pail over a pan for this purpose?

3. What is the objection to setting a pail part way in the ground if the poultry house has a ground floor?

4. What advantage does a watering stand have over setting the pail on the floor?

5. What size of pail have you available for this purpose and what is its diameter at top and bottom?

6. What dimension in this plan is determined by the size of pail?

7. What grade and kind of lumber would you use for the stand?

8. Make out a bill of material for the stand as you would build it stating the number of pieces, their size and where in the stand each is to be used.

9. If you are not satisfied with the height of the stand as in the drawing what would you use and what members would you change the dimensions of?

10. State the kind and size of nails to be used in assembling the stand and tell how many you would use at each joint.

11. State the order in which you would assemble the parts.

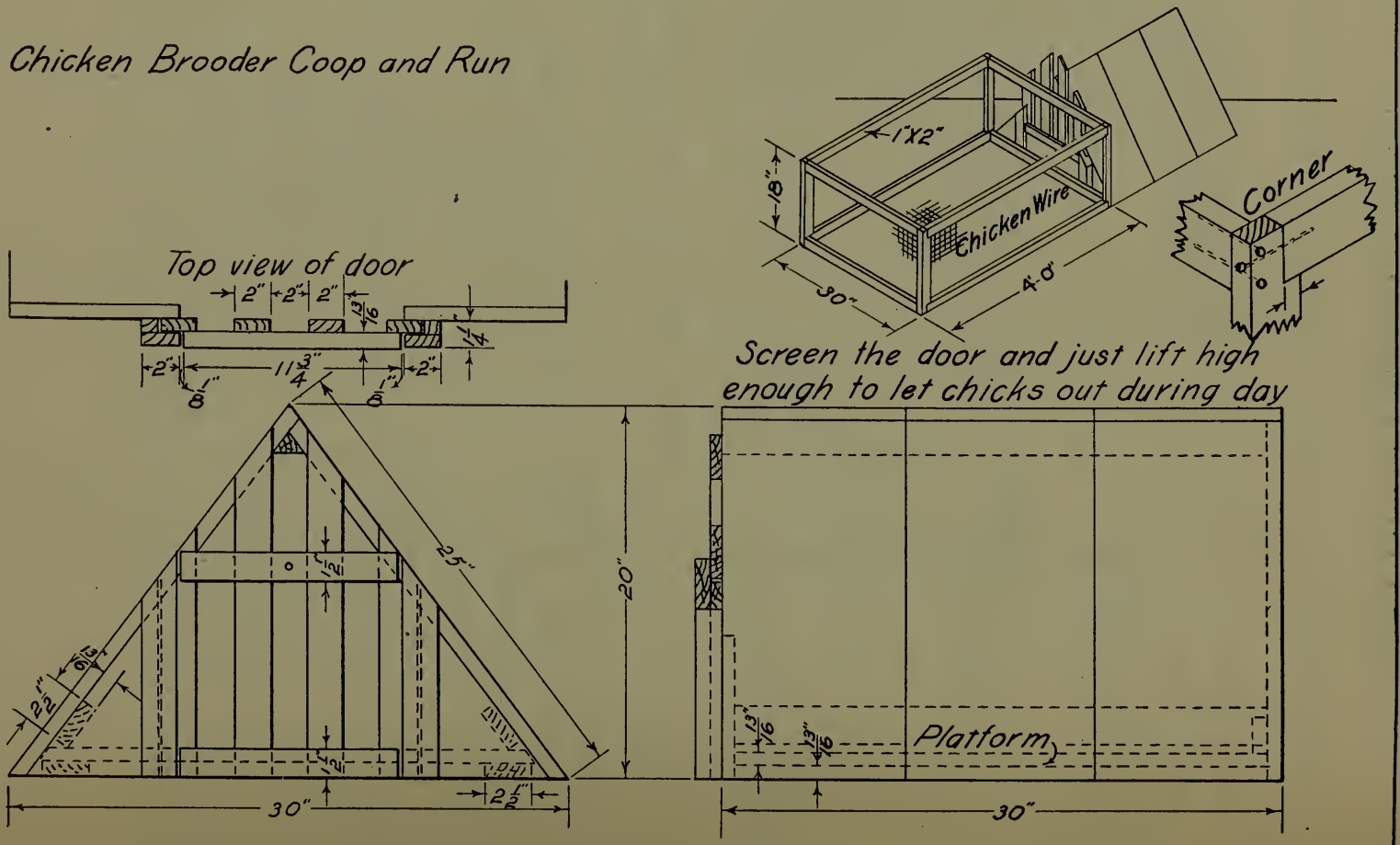
12. Suppose you desire to build a stand so that the top of the pail is nearer the top of the platform how would you accomplish it?

13. If you do not have two 11″ boards for the platform and need to use narrower boards what size of cleats would you use to nail up a platform and where would you place them?

14. What advantage has a watering stand over an ordinary box with a hole in it for the pail?

15. What advantage has a movable stand over one that is permanently fastened to the wall of the poultry house?

Chicken Brooder Coop and Run



CHICKEN BROODER COOP AND RUN

Material Required

Lumber: 1 piece 13/16″x9″x10′-0″ white pine, Oregon pine, cypress or redwood.
1 piece 13/16″x2½″x10′-0″ white pine, Oregon pine, cypress or redwood.
1 piece 13/16″x2″x7′-6″ white pine, Oregon pine, cypress or redwood.
1 piece 13/16″x1½″x2′-0″ white pine, Oregon pine, cypress or redwood.
1 piece ⅞″x1″x2′-0″ white pine, Oregon pine, cypress or redwood.

Hardware: ¼ lb. 4d common nails.
1 lb. 6d common nails.
21 lineal ft. 18″, 1″ mesh chicken wire.
¼ lb. ¾″ poultry netting staples.

Stock Bill

Pieces	Finished Dimensions	Use	Pieces	Finished Dimensions	Use
3	13/16″x9″x28⅜″	Platform	3	13/16″x10″x25″	Roof
4	13/16″x2½″x27″	Cleats for bottom and sides	3	13/16″x10″x24¼″	Roof
			1	13/16″x10″x20″	Back
2	13/16″x2″x19″	Middle door slats	2	13/16″x9″x18″	Back
			1	13/16″x2½″x23″	Cleat for back
2	13/16″x2″x13½″	Side door slats	2	13/16″x1½″x11¾″	Cleat for door
2	13/16″x2″x12″	Front piece of slot for door	4	13/16″x2″x3′-9″	Run sides
2	⅞″x1″x11″	Back piece of slot for door	4	13/16″x2″x2′-4⅜″	Run ends
			4	13/16″x2″x18″	Run posts

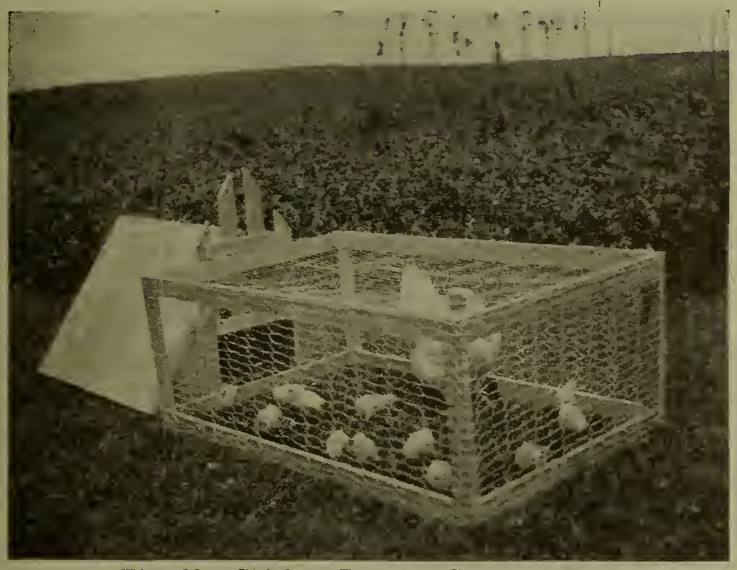


Fig. 22. Chicken Brooder Coop and Run.

Directions

1. Reduce all pieces to finished dimensions and label each piece. Labels should be written neatly with letters about the size used in writing on paper. Careless writing does not look well on woodwork.

2. Fasten bottom cleats to bottom by driving two 6d common nails in each board at each end. The nails are longer than the thickness of the boards and should be driven at a slant so as not to go through.

3. Fasten cleats to roof boards same as bottom and drive two nails into each board at the ridge.

4. For laying out the slant on upper end of pieces for back and front the T bevel should be used and may be set at the same angle as the drawing.

5. Fasten cleat to back pieces the same as bottom and roof; set back pieces in place and nail through edge of back roof board.

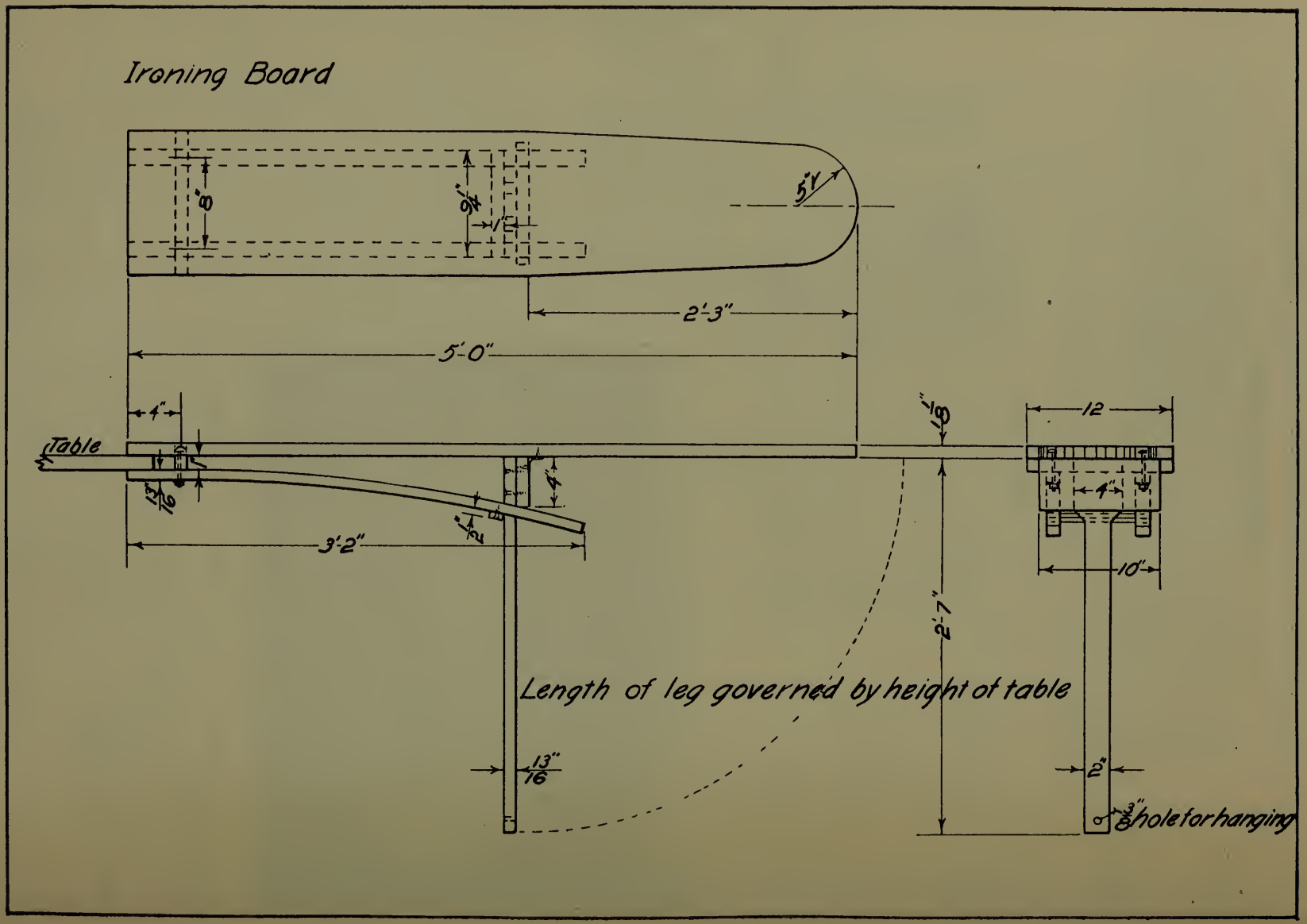
6. Nail the two lower front pieces firmly in place by nailing through edge of front roof board and one nail in end of roof board cleat.

7. Place cleats for door as shown in "Top view of door" and fasten with 6d nails.

8. Fasten cleats to door by using two 4d common nails at each joint. Take a few shavings from the side of the side pieces so the door may slide freely.

9. Cut the ends of the corner posts of the run as shown in the detail drawing and join the corners with three 6d common nails placed as shown in detail of corner. Assemble the sides and ends first.

10. In fastening the wire begin at one corner and run the wire around the run, cutting the opening for the door as wide as the door and eight inches high. Do not cut the bottom strand of wire. Staples should be placed not more than 6 inches apart.


Ironing Board
8"
9½"
5"
2'-3"
5'-0"
4"
Table
13/16"
4"
2"
3'-2"
1⅛"
12
4"
10"
2'-7"
Length of leg governed by height of table
13/16"
2"
⅜" hole for hanging

11. Run the wire lengthwise at the top and fasten with staples at the end and sides.

12. Bore a ⅜ inch hole through the upper door cleat at the center. A peg placed in this hole may rest on the upper end piece of the run and hold the door open. A similar hole through a slat of the door and into the front edge of the front roof board furnishes a place for the peg to hold the door open when the run is not in use. A brooder coop should be built so that the roof may be removed and the platform thoroughly cleaned.

IRONING BOARD

Material Required

Lumber: 1 piece white pine, poplar or basswood, 1⅛″x12″x5′-0″.
1 piece white pine, poplar or basswood, ⅜″x4″x3′-6″.
1 piece birch or oak ⅜″x1¼″x8′-4″.
Hardware: 2 carriage bolts ¼″x2½″ with 2 washers each.
4 flat head bright wood screws 1¼″, No. 8.
4 flat head bright wood screws ⅞″, No. 7.
2 steel butt hinges, riveted, with 1⅛″ screws.

Stock Bill

Pieces	Finished Dimensions	Use
1	1⅛″x12″x5′-0″	Board
2	⅜″x1¼″x3′-2″	Clamps
1	⅜″x1″x12″	Parting Strip
1	½″x2½″x9¼″	Cross Bar
1	⅜″x4″x2′-7″	Post
1	⅜″x4″x10″	Post and Hinge Support

Directions

1. Reduce all pieces to finished dimensions.

2. To shape the board draw a center line lengthwise of stock and swing an arc with 5″ radius on center line 5″ from end.

3. Draw lines across both edges 2′ 3″ from the same end as the arc.

4. Remove stock to line with saw, draw knife and plane.

5. Locate points for bolts 4″ from end and 2″ from edge and bore a 11-16″ hole ½″ deep on the upper edge of board.

6. Bore ¼″ holes through the board in center of 11-16″ holes, and through the parting strips and clamps.

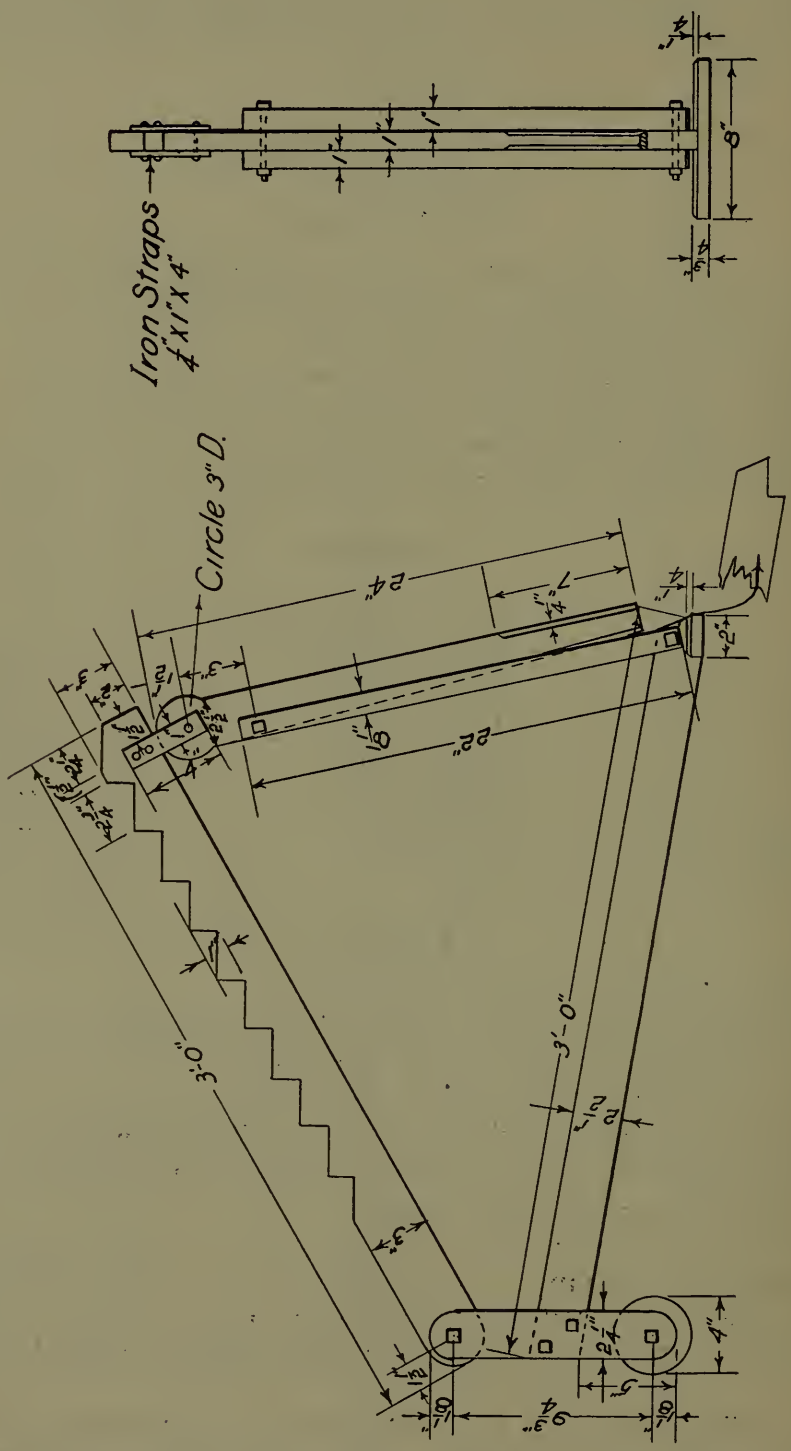
7. Bolt these three members in place and plug the 11-16″ holes.

8. Fasten the post to the post and hinge support with four 1¼″ No. 8 screws.

9. Cut a small groove in the lower side of the board and also in the edge of the post and hinge support for the joint of the hinges and fasten the hinges.

10. Place the board on the bench and the post standing up at right angle to the board and fasten the cross bar to the clamps so that it touches the post. The cross bar is better if 2½″ wide and fastened with 2 screws at each end than if a piece only 1″ wide is used as in the drawing.

11. Bore the ⅜″ hole in the lower end of post for hanging the board.



Wagon Jack.

WAGON JACK

Material Required

Lumber: 1 piece oak, birch, maple or other hardwood 1″x6″x6′-6″.
Hardware: 6 machine bolts 3/8″x3½″ with washers.
2 flat head, bright wood screws 1½″, No. 10.
2 pieces of iron ¼″x1″x4″.
3 iron rivets ¼″x1¾″.

Stock Bill

Pieces	Finished Dimensions	Use
1	1″x3″ x3′-0″	Top
1	1″x2½″x3′-0″	Main Brace
2	1″x2¼″x12″	Front Standards
2	1″x1⅛″x22″	Back Standards
1	1″x3″ x24″	Lever
1	¾″x2″ x 8″	Foot
1	⅞″x4″ x 4″	Wheel

Directions

1. Reduce all pieces to finished dimensions.

2. Round one end of the top by swinging an arc on a centerline at one end with a radius of one and one-half inches, and remove stock with saw and chisel.

3. Lay out axle notches by drawing lines across the upper edge of the top two and three-quarters inches apart, and another line on the side of the stock one inch from the top edge. Cut the notches with the rip and cross-cut saws.

4. Round the ends of the front standards by swinging arcs on a center-line one and one-eighth inches from the end with a one and one-eighth inch radius.

5. Find the center of the piece for the wheel by drawing lines diagonally across the stock, and swing the circle with the compass set at a 2 inch radius.

6. Lay out the lower end of the main brace as shown in the detail drawing to fit the foot, and cut the upper end at a bevel.

7. Lay out and cut a one-quarter inch chamfer around the upper edge of the foot excepting where it fits into the main brace.

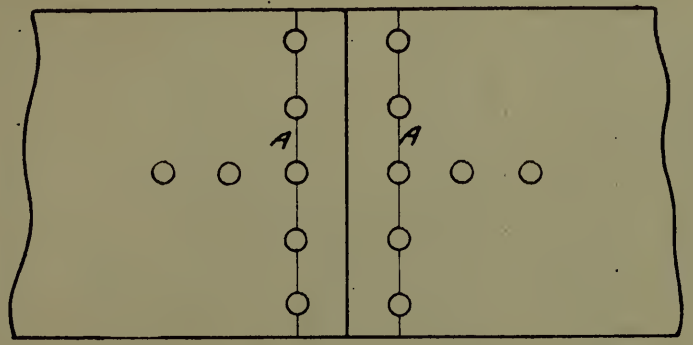
8. Swing a circle on a centerline drawn lengthwise of the lever one and one-half inches from the upper end with the compass set at one and one-half inch radius; taper the lever to one and one-half inches at the lower end, and remove the stock to line. Lay out and cut a one-quarter inch chamfer at all four corners of the lever as shown in the drawing.

9. Fasten the foot to the main brace with two one and one-half inch No. 10 flat head, bright wood screws.

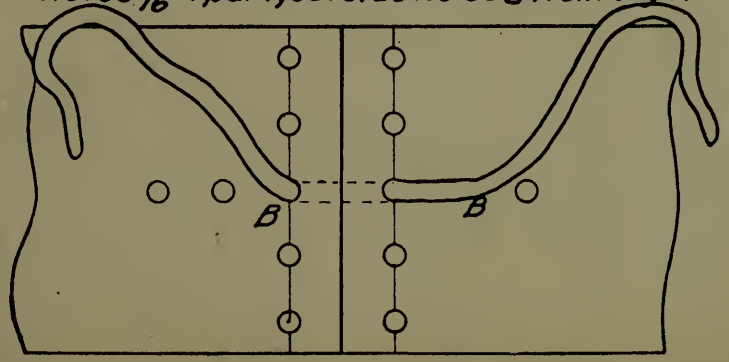
10. Bore holes with three-eighths inch bit for bolts at positions shown in the drawing and assemble parts with bolts.

11. Bore one-quarter inch holes for rivets of iron plate at center of circle of lever, as shown in the drawing at upper end, and fasten plates by riveting in position.

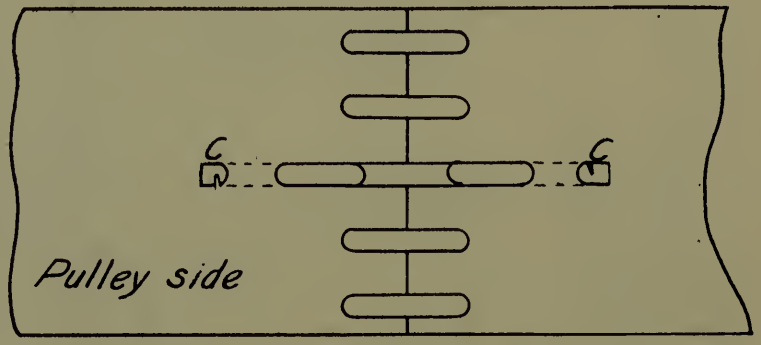
Lacing a Belt with a Rawhide Thong



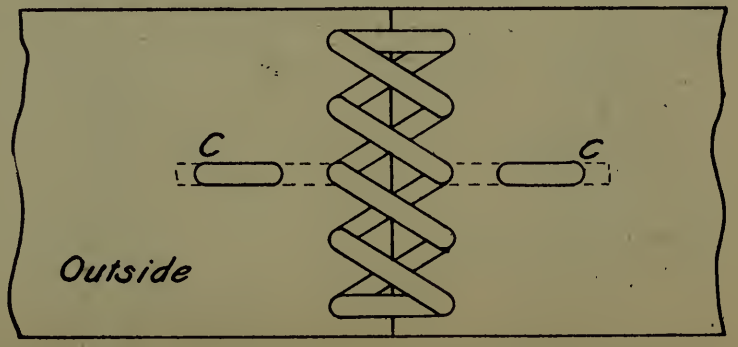
Cut ends to be laced perfectly square
Draw lines, AA, $\frac{5}{8}$" from ends and punch
5 holes $\frac{13}{16}$" apart, outside holes $\frac{3}{8}$" from edge.



Draw thong through center holes and
bring ends up tight

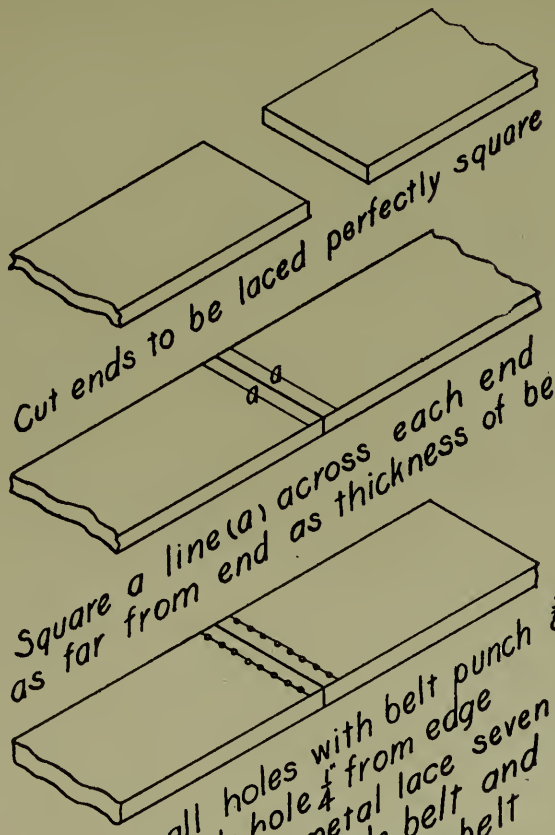


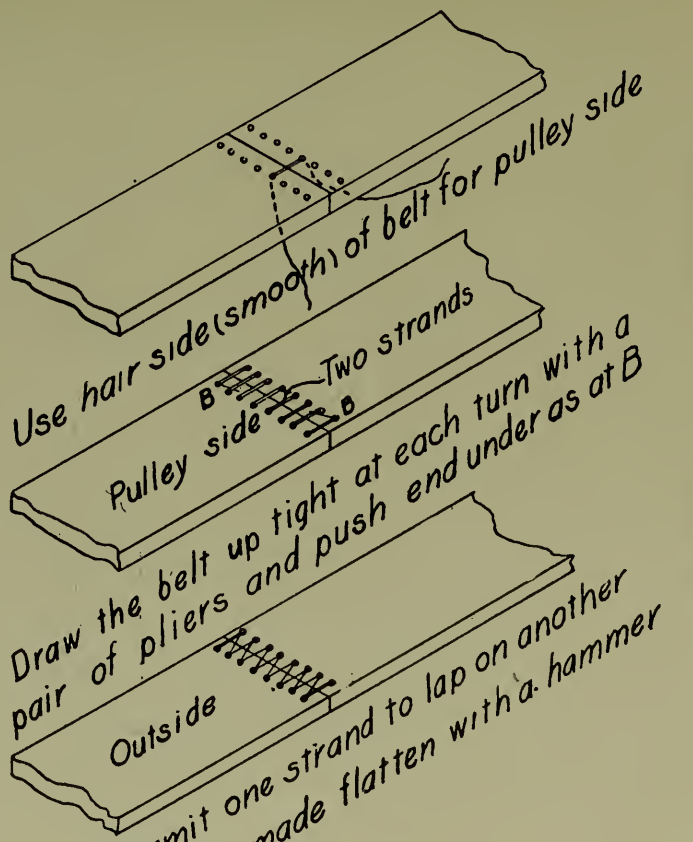
Commence as at B B and lace each way
keeping lace from twisting; lace to be
double on pulley side and end at C, C.



Cut lace after passing through holes,
C, C, and nick with knife so it won't slip out.

Lacing a Belt with Metallic Wire Belt Lacing


Cut ends to be laced perfectly square
a
a
Square a line (a) across each end as far from end as thickness of belt
Punch small holes with belt punch $\frac{3}{8}$" apart placing outside hole $\frac{1}{4}$" from edge
It takes a piece of metal lace seven times the width of a single belt and nine times for a double belt


Use hair side (smooth) of belt for pulley side
B
Two strands
Pulley side
B
Draw the belt up tight at each turn with a pair of pliers and push end under as at B
Outside
Do not permit one strand to lap on another
After joints are made flatten with a hammer

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